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Rediscovering local roots and interactions in management

Conference Proceedings

Long Papers

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To the reader,

this volume contains the long papers of the Sinergie-SIMA 2023 Management Conference, hosted by the LUM University and University of Bari at Mercure Villa Romanazzi Carducci (Bari) on June 29th and 30th 2023.

Theory and practice in the field of management have been challenged by the emergence of deep transitions such as those driven by globalization, the rise of social and environmental issues, and the diffusion of digital technologies. Events such as the ensuing geopolitical crises and the pandemic further contribute to spur management scholars to feel the call to produce impactful research with theoretical and managerial implications on the relationship between location and strategy (Bathelt and Li, 2022).

As a consequence, scholars and practitioners have been asked to design new business models and rethink value chains in a twofold direction (Mazutis et al., 2021). First, the relevance of local roots sheds light on the way people create and shape places, as much as places shape people and their organizations, suggesting a need to rethink how all lives ‘take place’ in places, as well as how all business happens in places (Sternad et al., 2017). Second, a need for new interactions emerges, suggesting that businesses are deeply connected to their roots, that are their homes, from which they draw inspiration, identity, and sources of competitive advantage (Soderstrom and Weber, 2020).

Rediscovering local roots and specific assets, as well as developing new ways of interaction among the economic actors and their stakeholders, can help firms to design effective and innovative strategies to create and share values (Mair et al., 2016), with positive economic, social, and environmental impacts (Attig and Brockman, 2017).

Several research questions stimulate an interdisciplinary debate in the field of management. These questions relate to the ability of firms and managers to move, among the others, between global and local relations, near/physical and far/digital interactions, reshoring and offshoring activities, omnichannel competition and retail interactions, market transactions and system operating structures, traditional and innovative approaches, social/local benefits and financial/global performances, business ethics and ethics in business.

In the same way, different theories, methodological approaches, and units of analysis are required to generate scientific research that has an impact not only in terms of theoretical contribution but also on the real business world.

The Sinergie-SIMA 2023 Management Conference was a great occasion to discuss about the research efforts of our research community on thematic tracks related to the Conference theme (the function of territorial or cultural roots and of operational interactions in management) and the SIMA thematic groups (Entrepreneurship, Innovation & technology management, International business, Marketing, Retailing & Service management, Small & family business, Strategic communication, Strategy & Governance, Supply chain management, logistics & operations, Sustainability, and Tourism and culture management).

The Conference call for papers gave the opportunity to submit either short or long papers. Overall, the editorial staff received 215 short papers and 63 long papers.

For the *short and long papers*, the evaluation followed the peer review process, with a double-blind review performed by two referees - university lecturers, expert about the topic - selected among SIMA and the community of Sinergie members.

In detail, the referees applied the following criteria to evaluate the submissions:

- clarity of the research aims,
- accuracy of the methodological approach,
- contribution in terms of originality/innovativeness,

- theoretical and practical contribution,
- clarity of communication,
- significance of the bibliographical basis.

The *peer review* process resulted in full acceptance or rejection of the submissions. In the case of disagreement among reviewers' evaluations, the decision was taken by the Chairs of the SIMA thematic groups or conference track. Each work was then sent back to the Authors together with the referees' reports. The suggestions received by the referees were used by the Authors during the presentation of their research works at the Conference.

The evaluation process ended with the acceptance of 215 short papers and 62 long papers, which were published in two distinct volumes.

All the long papers published in this volume were presented and discussed during the Conference and published online on the web portal of Sinergie-SIMA Management Conference (<https://www.sijmsima.it/>).

While thanking all the Authors, Chairs and participants, we hope that this volume will contribute to advance knowledge about the rediscovering local roots and interactions in management.

The Conference Chairs

Angelantonio Russo, Savino Santovito, Arabella Mocciaro Li Destri and Marta Ugolini

SUMMARY

<i>Unpacking the drivers of the socio-environmental sustainability of new ventures: Insights from innovative digital start-ups in Italy</i> LEONARDO MAZZONI, SILVIA RITA SEDITA	PAG.	1
<i>Unlocking the potential of professional social matching in innovation ecosystems: A conceptual framework and research agenda to foster local interactions in global networks</i> MATTEO SPINAZZOLA, NICOLA FARRONATO, ALAN MURRAY, MARCO PIRONTI	“	13
<i>Wellbeing and sustainability in the marketing literature: A bibliometric approach</i> FRANCESCA CELIO, FRANCESCO RICOTTA, MICHELA ADDIS	“	29
<i>Reaching the SDGs by : At what point is Italy? Evidence from firms at the regional clusters' level</i> RAFFAELLA MONTERA, SALVATORE ESPOSITO DE FALCO	“	45
<i>Local resources and interactions in an entrepreneurial ecosystem perspective: An introductory study</i> MARIA GRAZIA STRANO	“	61
<i>Low-cost carriers in the tourism industry: A big data perspective on destination management</i> FRANCESCO RUSSO, ALESSIA MUNNIA, MELITA NICOTRA, MARCO ROMANO	“	75
<i>Sport facilities of Eastern Macedonia and Thrace Region in Greece. A project for sport development</i> GEORGIA YFANTIDOU, PANAGIOTA BALASKA, ELENI SPYRIDOPOULOU, ALKISTIS PAPAIOANNOU	“	87
<i>Why are born-digital retailers expanding offline?</i> GIULIA CASAGRANDE, BIRGIT HAGEN	“	109
<i>Gender diversity in the workplaces: Regulatory framework, public policies, and a possible future scenario in Italy</i> SALVATORE ESPOSITO DE FALCO, ROSARIO BIANCO, GIUSEPPE CALABRESE, ELAHEH ANJOMROUZ	“	125
<i>Diversity & Inclusion: una review bibliometrica</i> CARMELA DI GUIDA, FRANCESCO LAVIOLA, SALVATORE ESPOSITO DE FALCO	“	147
<i>Effetti sulla performance delle leggi sulle quote di genere</i> MARIASOLE BANNÒ, EMILIA FILIPPI, CHIARA LEGGERINI	“	171
<i>Linking humane resource management and CSR: A focus on the drivers of employees' commitment towards sustainability</i> ANTONIO BOTTI, CHIARA CRUDELE, ROSANGELA FEOLA, MASSIMILIANO VESCI	“	183
<i>Exploring the drivers of sustainable transformation in corporations: Deliberate change or unconscious shift?</i> MARGHERITA MILOTTA	“	199
<i>Challenges and opportunities of digital nomadism for minor tourism destinations: The case of Valsugana (Italy)</i> SERENA LONARDI, FEDERICA BUFFA, UMBERTO MARTINI	“	213
<i>Concrete action system in shaping an organizational field for root tourism exploitation. The case study of “Rete Destinazione Sud”</i> CLAUDIO NIGRO, ENRICA IANNUZZI, ROSA SPINNATO, SIMONA CURIELLO	“	225
<i>Digital platform ecosystems: A multi-layer analysis of their emergence in rural areas</i> GIOVANNA TERRIZZI, ALBA MARINO, MARIA CRISTINA CINICI, DANIELA BAGLIERI	“	243
<i>Sustainable business model innovation for local development: The role of knowledge management</i> ADRIANA APUZZO, MARA GRIMALDI, ANTONIETTA MEGARO, FRANCESCO POLESE, MARIO TESTA	“	261

<i>Can authenticity be built? Looking for factors that influence authentic brand activism</i> ANTONELLA CAMMAROTA, FRANCESCA AVALLONE, VITTORIA MARINO, RICCARDO RESCINITI	PAG.	283
<i>Ecofeminism and entrepreneurship: The case study of People’s Bank of Govanhill</i> SIMONE GIBELLATO, LEA IAIA, DAVIDE CANAVESIO	“	297
<i>Exploring humane entrepreneurship in locally rooted tourism micro-small-medium enterprises</i> ANTONIO BOTTI, ORLANDO TROISI, MARA GRIMALDI, GIOVANNI BALDI	“	309
<i>Local root and university link: Digitalisation and SDGs. A literature review</i> FILOMENA IZZO, MARILENA BREDICE, VIKTORIIA TOMNYUK, MICHELE MODINA	“	327
<i>Human resource development and artificial intelligence in the view of personal development: A literature review and bibliometric analysis</i> FRANCESCO LAVIOLA, NICOLA CUCARI, HARRY NOVIC	“	347
<i>Open innovation and social norms: An integrated framework for the understanding of trust-based relationships</i> GINEVRA ASSIA ANTONELLI, MARIA ISABELLA LEONE	“	373
<i>Are consumers’ food purchase intentions impacted by blockchain technology?</i> ELISA MARTINELLI, FRANCESCA DE CANIO	“	383
<i>Business model innovation and ambidexterity in Industry .</i> MARCO PAIOLA, ROBERTO GRANDINETTI, FRANCESCO SCHIAVONE	“	397
<i>Sustainable entrepreneurship: How the food industry is adapting to meet the demand of a changing world</i> PETER ŠEDÍK, ERIK JANŠTO, ELENA HORSKÁ, SAVINO SANTOVITO, GAETANO MACARIO	“	415
<i>Tecnologie digitali e nuovi modelli di business per le imprese born global</i> ALESSIO TRAVASI, GIORGIA MASILI, FABIO MUSSO	“	421
<i>Stakeholders perception towards family firm brands: The influence of family firms CEO identity</i> CARLOTTA BENEDETTI, PAOLA ROVELLI, ALFREDO DE MASSIS, KURT MATZLER, NINA SCHWEIGER	“	433
<i>GREENING THE FUTURE. An empirical study on the relationship between Industry. And environmental and social sustainability in the Italian ceramic industry</i> GIUSEPPE PIRRONE	“	443
<i>Research impact management: A strategic approach to promote innovation</i> MARCO ROMANO, JAMES CUNNINGHAM, GIACOMO CUTTONE, ALESSIA MUNNIA, MELITA NICOTRA	“	459
<i>Digital entrepreneurial ecosystems: An empirical contribution using SMAA</i> ALESSIA MUNNIA, SALVATORE CORRENTE, JAMES CUNNINGHAM, MELITA NICOTRA, MARCO ROMANO	“	475
<i>Digging local roots and territorial capital in management: A structured literature review (SLR) and bibliometric analysis</i> ANNUNZIATA TARULLI, DOMENICO MORRONE, RAFFAELE SILVESTRI, KAROLINA SALLAKU	“	491
<i>Intangibles, technologies, and logistics resilience. Preliminary findings from the pharmaceutical and automotive sectors</i> FRANCESCA FAGGIONI, MARCO VALERIO ROSSI, ALBERTO PEZZI	“	511
<i>Packaging, logistics and sustainability. Exploring innovative solutions for eco-sustainable packaging</i> ALESSANDRA COZZOLINO	“	519
<i>Corporate social responsibility and financial performance: An empirical analysis of the Italian case</i> DAVIDE LIBERATO LO CONTE, GIUSEPPE SANCETTA, RAFFAELE D’AMORE	“	531
<i>Sustainability commitment of Made in Italy: A deep dive into the fashion industry sector</i> KAROLINA CRESPI GOMES, SILVIA RITA SEDITA, VANESSA PELLEGRIN, AMIR MAGHSSUDIPOUR	“	547

<i>How sustainable is smart farming? The contribution of service platforms to innovate Italian agribusinesses</i>		
MARIA VINCENZA CIASULLO, MARCO SAVASTANO, ALEXANDER DOUGLAS, MIRIANA FERRARA, SIMONE FIORENTINO	PAG.	567
<i>Some methodological remarks for a sustainable management, An explainable artificial intelligence paradigm approach</i>		
ERNESTO D'AVANZO	“	585
<i>The unequal battle against climate change: Exploring the effect of power distance on the relationship between women on boards and GHG emissions</i>		
MASSIMO MARIANI, FRANCESCO D'ERCOLE, DOMENICO FRASCATI	“	601

Unpacking the factors behind the socio-environmental sustainability orientation of digital-oriented startups

LEONARDO MAZZONI* SILVIA RITA SEDITA•

Abstract

Framing of the research. *Digital-born companies represent a concentration of cutting-edge knowledge and on-the-frontier competencies. A narrow part of the entrepreneurship literature has analyzed the transformative capacity of ICT startups as a potential key driver to tackle grand-societal challenges, for their capacity of altering business models and/or optimizing existing resources.*

Purpose of the paper. *Previous research has spotted a lack of research considering the sustainability drivers of ICTs startups with a main focus on the environmental sphere. This work aims to fill this gap, investigating the market and innovation-related factors driving the two social and environmental orientations and if distinctive mechanisms for the two aspects can be identified.*

Methodology. *Econometric estimation (ordinal logit model) on a sample of 173 innovative ICT startups based in Italy.*

Results. *Results provide novel insights into the sustainability drivers of digital startups, highlighting different driving factors of the social and environmental orientation of new digital-related firms.*

Research limitations. *The research setting is limited to Italy and future research agendas might include an examination of other national settings to see if results still hold. Moreover, observing the startup over a longer period could help to see if the determinants vary according to the startup's stage of development.*

Managerial implications. *Startups' founders and managers aimed to pursue strategy oriented to sustainability should consider the different factors that influence the adoption of social and green practices (e.g collaboration in an open innovation paradigm or visibility towards external stakeholders).*

Originality of the paper. *We contribute to the development of the novel literature that links technological entrepreneurship and sustainability, providing a distinctive measure of green and social orientation.*

Key words: *digital entrepreneurship, green sustainability, social sustainability, ICT startups, sustainable business models*

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1. Introduction

In the last decade, the shifting nature of products and processes towards the digital paradigm has drastically modified the functions and organization of economic systems and innovative activities (Yoo *et al.*, 2012; Porter and Heppelmann, 2015). In this regard business opportunities enabled by the reproducibility, “distributedness” and generativity of digital objects (Kallikos *et al.* 2013), have favored the massive emergence of new ICT startups across the globe (Nambisan *et al.*, 2019).

Moreover, the fourth industrial revolution and consequent policy interventions have stimulated the transformation of traditional industries modifying production and consumption paradigms, which are increasingly dependent on the adoption of ICT means. The need of changing the business models of organizations became of paramount importance, soliciting a complementarity between new ventures creating enabling technologies and incumbents adopting their solutions (Baskerville *et al.*, 2020; Nambisan *et al.*, 2020). Thanks to the pervasive adoption of digital technologies across different industries, “digital-born companies” play a significant role in the current techno-economic scenario, representing a concentration of cutting-edge knowledge, new tools and on-the-frontier competencies (George *et al.*, 2021; Mazzoni *et al.*, 2021).

The rise of this new digital paradigm is not without drawbacks. Emergent literature pointed out the dark side of innovation and digital technologies (Coad *et al.*, 2021), i.e. energy consumption, e-waste, and the exhaustion of rare metals (Nadjahi *et al.*, 2018; Yunxiong *et al.*, 2022).

This is connected with the notion of a “*tipping point*” (Lenton *et al.*, 2008) that the earth system and humanity have entered, defined as a phase of “*critical transition*” (Scheffer *et al.*, 2012), which lead the global agenda to increasingly address a set of macro-challenges, such as environmental crisis; transition to new energy models; shortage of basic inputs for life (Food, Energy, Water).

Despite this double edge sword, a narrow part of the entrepreneurship literature has analyzed the relationship between the emerging digital phenomenon and the transformative capacity of ICT startups as a potential key driver to tackle grand-societal challenges, altering business models and/or optimizing existing resources (Elia and Passiante, 2020; Gregori and Holzmann, 2020).

Following this line of reasoning, we underline the importance to analyze the sustainability drivers of ICT startups for their central position in the economic system. To date, few studies have empirically examined the determinants of the sustainability orientation of new ventures, mainly focusing on the environmental sphere. However, innovation activities show unintended consequences prevalently related to the social sphere (Biggi and Giuliani, 2021; Coad *et al.*, 2021), such as extremely temporary work modalities, social relationships, the impact on society of firms’ activities, the commitment to the local development of communities (Lange and Schmidt, 2021).

There is a lack of research considering both the social and environmental sustainability of new ventures and disentangling the factors driving the two orientations. This work aims to fill this gap, in the realm of digital companies, adopting a wider notion of sustainability, which includes (a) the social and (b) the green orientation of startups. In particular, we assess the impact of: (i) *Market Strategy* and (ii) *Innovation Attitude* of new ventures in shaping their sustainability orientation. We conceptualize the former, *Market Strategy*, as the long-term plan for increasing the customer base, by means of “visibility actions” (branding and relationship building) and networking, i.e. the typology of different collaborations within the business ecosystem to support the early phase of development (Fraj-Andrés *et al.*, 2009; Dickel *et al.*, 2018; Sheoran and Kumar, 2020). We conceptualize the latter, *Innovation Attitude*, as a radical mindset in terms of market exploration and openness towards external collaboration (Jesus *et al.*, 2021; Allal-Chérif *et al.*, forthcoming 2023).

The research questions are the following: 1) What is the impact of market strategy as a driver of sustainability in digital start-ups? 2) What is the impact of innovation attitude as a driver of sustainability in digital start-ups? 3) Are the drivers for green sustainability different from the ones for social sustainability?

Our empirical setting is digital start-ups in Italy, and data come from an original survey administered to 173 new ventures in 2018 (right before the pandemic). Results from ordered logit

models provide insights into the sustainability drivers of digital start-ups, highlighting differences in social and environmental sustainability drivers.

The remainder of the paper is organized as follows. Section two illustrates the theoretical background, section three presents the methodology, section four shows the results, and, finally, section five puts forward discussion and conclusions.

2. The socio-environmental sustainability of new ventures

2.1 Entrepreneurship and sustainability

Entrepreneurship has been identified as a tool to solve societal problems (Shane and Venkataraman, 2000; York and Venkataraman, 2010; Bianchi and Verganti, 2021). This is related to the fact that, as argued by York and Venkataraman (2010), one of the main motivations behind the survival/success of entrepreneurial ventures is to address problems that are untreated or badly framed by incumbents. In doing so, entrepreneurs strive to better deal with uncertainty, innovation, and resource allocation challenges. These three critical issues are strictly related to ways of pursuing sustainable strategies and practices and will be better explained in the following.

Uncertainty is related not only to the trouble in the identification of environmental and social problems and the best methods to solve them, but also to the ambiguity and difficulty to coordinate and align incentives of multiple actors, such as clients and suppliers, as well as corporate backers and business partners.

Innovation does not comprehend only technological means but also organizational and market solutions for sustainability. The difficulty is to translate sustainability goals into products/services/business models able to have an impact on existent consumption and production model in a systemic manner. The role of entrepreneurs is not only to support the process of creative destruction in the field of advanced technologies but also to wrangle over the institutional status quo (York and Venkataraman, 2010). In particular, the achievement of new sustainable business models can be framed as a dynamic capability, for the conception of alternative business models and the “sensing” of opportunities and threats (Liboni *et al.*, 2022).

Resource allocation depends on the capacity of entrepreneurs to place their strategic resources in the best possible ways, i.e. able to maximize the creation of profits and jobs, as well as the achievement of sustainability goals. Such complex (still unmet) problems represent important opportunity spaces for entrepreneurship for achieving profit with betterment for society (Dean and McMullen, 2007). The ability to tackle the three above-described challenges can indicate the degree of convergence between entrepreneurship and sustainability (Passaro *et al.*, 2022).

2.2 Sustainable business models in new ventures

Which is the role of new ventures in accelerating this path toward sustainability? The adoption of a sustainable business model since the early beginning of the start-up life is crucial in determining its impact on the environment and society at large, but not an easy task. Orientation to the environment can be lower during the first phases of startup growth as lack of resources to dedicate to this specific goal (Dickel *et al.*, 2018). Accordingly, the strategic actions of newborn firms are, in general, initially directed at short-term business goals aimed to increase their survival likelihood (Hörisch *et al.*, 2019), constraining their effort devoted to social and environmental business aspects (Dickel *et al.*, 2018). Hart (1995) supports the idea that this radical integration of sustainability in the strategic approach of the firms in terms of resources and objectives would require a long tempo to align the interest of internal and external stakeholders (see for instance the case of Patagonia¹). Nevertheless, Banerjee (2002) has adopted the notion of “*corporate environmentalism*”, as the

¹ Ross A. (2021). *The Raging 2020s: Companies, Countries, People—and the Fight for Our Future*. Random House, chapter 1 “Shareholder and Stakeholder Capitalism”.

awareness of firms' that environmental issues are no more a by side options of doing business. The author underlines that corporate environmentalism is a primary an obliged passage as firms are not external entities to the construction of societal value, especially new firms that also represent the values and identities of new generations.

In particular, we believe that two relevant aspects of the sustainability orientation of new ventures are linked to their market strategy and innovation attitude choices.

2.2.1 Market strategy and sustainability

Establishing a market strategy to address sustainability refers to the actions undertaken by firms to orient customers' needs, sometimes reducing information asymmetry between technical knowledge and clients, in other cases trying to communicate better the green and social value of products (Dean and McMullen, 2007; Keskin *et al.*, 2013; Wang *et al.*, 2019). Startups and firms in general are nowadays exposed to internal and external stakeholder pressure for the environment and social values (Dickel *et al.*, 2018). The effect of business ecosystem demand for high standard levels to remain competitive has been identified as a major driver to disseminate responsively (to align with legislation) or proactively (to anticipate trends) (González-Benito and González-Benito, 2008; Testa *et al.*, 2016; Liboni *et al.*, 2022). Multiple network partners can drive the startups' strategy and operations, by exerting different typologies of pressures, especially if the firm/startup is embedded in a multiple (and dense) set of trustful relationships (Sheoran, and Kumar, 2020; Riandita *et al.*, 2019; Obi-Anike *et al.*, 2022).

As a consequence, new firms more exposed to the influence of external stakeholders have more chance to transform into environmental-friendly actors for marketing reasons, as they know more deeply the expectations of their partners (Keskin *et al.* 2013). In this case, actions oriented to promote the visibility of the firm can be a signal of the capability of the startups to perceive environmental actions mostly as a strategic competitive advantage.

2.2.2 Innovation attitude and sustainability

The innovation mindset of entrepreneurs is a leading factor in driving the creation of sustainable products/services. This is because the capacity to imagine different scenarios by recombining existing resources by means of the introduction of new approaches is a prerogative of brilliant entrepreneurs (Bianchi and Verganti, 2021). In particular, the willingness of creating new markets or completely new goods/services is a sign of the capacity for alternative problem framing and passion for complex challenges, fundamental ingredients to promote the adoption of sustainable initiatives within the firms (Keskin *et al.* 2013; Bhupendra and Sangle, 2015).

Notwithstanding the potential gains of breakthrough innovations related to a new market shaping or the launch of a novel product/service are accompanied by high risks and uncertainty (Kuzma *et al.*, 2020) that could be mediated by the capacity of accessing high-level market and technical knowledge. For instance, the possibility to prototype or conduct experiments with intense collaboration could favor the adoption of sustainability practices, as risks are shared among participants and a common set of capabilities are assembled to respond to complex challenges (Michelino *et al.*, 2019). The Open Innovation paradigm implies the co-creation of values along with wide partnerships. This can favor the transition towards a more sustainable paradigm thanks to the interaction and cooperation with a variety of stakeholders. Actions taken by focal actors of supply chains of large business ecosystems can facilitate knowledge flows, supporting the adoption of best practices (Jesus and Jugend, 2021).

Developing new products/services able to meet sustainable characteristics implies owning strategic resources that are rare, valuable, non-substitutable. In an open innovation system, these resources are distributed along different actors beyond the focal firms of a production system (Riandita *et al.*, 2019). Therefore, exposure to different stakeholders' influence can stimulate the

birth of new ideas and/or the applications of existing ideas to different settings by entrepreneurs, with a potential impact for sustainable solutions development.

3. Methodology

3.1 Data

To conduct the study, we rely on the data on Italian Innovative Startups², born between 2012 and 2017. The register in the year 2018 counted 2914 companies, born between 2012 and 2017. With stratified sampling, we bifurcated the entire population into mutually exhaustive subgroups, by geographical area and industry codes. After, we evaluated the proportion in which the subgroups exist in the population, and we maintained this proportion in the sample. We selected the startups operating in NACE rev.2 sectors 62 and 63, obtaining a final sample of 173 startups, representative of the population of innovative ICT start-ups operating in Italy. The survey data come from the administration of a questionnaire through telephone interviews conducted by a Computer-Assisted Telephone Interview (CATI) service supply company between January 8, 2018, and March 14, 2018. The questionnaire is composed of 24 items divided into three parts and was addressed to one of the founders, reporting data and information on behalf of the other founders (when multiple founders existed). The first section collects data about the company's principal characteristics (company name; activity; whether the start-up is an independent company, a university spin-off, or a spin-off from an existing company; year of foundation; the number of founders; start-up phase (seed stage, start-up stage, growth stage, later stage e); the number of employees; turnover; whether the company has reached the BEP and the main reference market). The second section refers to the principal collaborations, funding sources, and 4.0 technologies adoption. The third section explores the firm's strategic orientation, reflecting its operational, marketing, and entrepreneurial choice to enhance (economic, social and environmental) and gain a competitive advantage.

3.2 Variables

Dependent Variables

Entrepreneurial orientation (codified as "ENV_orient.") is the startup commitment to the environment, measured through the responses to the question: "What is the company's commitment to the environment?". The variable ranges from 0 to 6 and it is measured as the sum of the responses to following items (dummy variables):

- uses production processes with reduced environmental impact
- suppliers are also assessed from an environmental point of view
- carries out training initiatives for personnel on environmental issues
- adopts policies to reduce energy consumption
- encourages the use of recycled materials
- it monitors the quantity of wastes in relation to production levels

Social orientation (codified as "SOC_orientat.") is the startup commitment towards the society/community of reference, and it is measured to responses to the question: "What is the company's commitment to the community of reference?". The variable ranges from 0 to 6 and it is measured as the sum of the responses to the following items (dummy variables):

² According to article 25 of Decree-Law no. 179/2012, the definition of Innovative Startup has to meet the following criteria (MISE, 2019): new company or incorporated for less than five years; headquarter in Italy; annual turnover lower than €5 billion; no profits' distribution; mission innovative oriented; no result of split-up or a company merger; able to satisfy at least one of the following innovation indicators: 1) expenses in R&D and innovation are at least 15% of the yearly costs; 2) 1/3 of employees with a Ph.D. or 2/3 with a master's degree are the holder, depositary, or licensee of a registered patent or software.

³ This study acknowledges the University of Padova Research Project 2014 (PRAT 2014) called "Moving knowledge into action: exploring the micro-foundation of an innovation ecosystem."

- supports social and environmental projects in the area
- carries out communication and community involvement activities (corporate citizenship)
- grants liberality in favor of not for profit associations, bodies or initiatives
- has activated partnerships with non-profit organizations for the realization of special projects
- has implemented initiatives to support the enhancement of the territory and cultural heritage
- has created a corporate not for profit or promoted voluntary initiatives at corporate level

Independent Variables

We measure market strategy along two criteria: visibility and networking. We selected these two, considering the respective importance of reputation and expansion of the collaboration base in the early years of the startup development (Fraj-Andrés *et al.*, 2009; Dickel *et al.*, 2018; Sheoran and Kumar, 2020). We measure Visibility as the sum of three dummies, namely increasing brand awareness, action devoted to promote internationalization and participation to business ecosystem.

We measure networking as the number of different typologies of collaborations with different actors. In this regard, we identify eight different typologies of collaborations (suppliers, clients, startup in the same sectors, startups in other sectors, companies in the same sector, companies in other sectors, private consultants, universities and research institutions), adopting the notion of “Breadth” operationalized by Laursen and Salter (2014) (for a similar approach see Sedita and Apa, 2016).

We measure Innovation attitude along two criteria: radical mindset and openness. Considering the general lack of established routines (unless of spinout/spinoff), we focus on these two, as relevant signals able to reveal the outlook of the startups in this regard.

We measure radical mindset as the capacity of the startup to shape a new market or create new radical products. This can be interpreted as a potential willingness to adopt new paradigms able to influence the adoption of new social and green initiatives with a degree of divergence in comparison to the past Jesus *et al.*, 2021; Allal-Chérif *et al.*, forthcoming 2023). We measure Openness as the intensity of the open innovation paradigm application, accounting only for the denser relationships considered for Networking. In particular we adopt the notion of “Depth”, operationalized by Laursen and Salter (2014) (for a similar approach see Sedita and Apa, 2016).

Control Variables

Some control variables have been added to the model. First, we consider a geographical area dummy (codified as “geo_area_CENTRE” and “geo_area_NORTH”) to check for possible spatial patterns. Second, we adopt a dummy variable to measure the Break-Even Point (codified “bep”) to control for the possible influence of a healthy accounting balance in supporting more sustainable attitudes of the company. Third, we control for the impact of human capital awareness about the importance of sustainability as a strategic direction for the company, including the percentage of graduates (Codified as “per_graduated 1”). Fourth, we control for the possible impact of gender diversity, as a determinant of ecological and social consciousness (Park *et al.*, 2012). In this respect, we measure the percentage of women in the total number of employees (codified as “women”).

Tables 1 and 2 report the descriptive statistics and the correlation matrix. Concerning the latter, we register the highest level of correlation ($> 0,5$) between market and technological Depth (0,751) and between market and technological Breadth (0,766). However, these couple of variables are tested in separate models, without risk of multicollinearity, as displayed in the results part (section 4).

Tab. 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
SOC orientation	173	1.538	1.686	0	6
ENV orientation	173	1.503	1.543	0	6
DEPTH mkt	173	1.566	1.522	0	8
DEPTH tech	173	1.561	1.633	0	8
BREADTH mkt	173	5.37	2.026	0	8
BREADTH tech	173	5.15	2.353	0	8
visibility	173	1.699	.983	0	3
innovative mindset	173	.867	.57	0	2
women	173	.139	.251	0	1
bep	173	.457	.5	0	1
per_graduated_1	173	.712	.388	0	1

Tab. 2: Matrix of Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) SOC_orientation	1.000										
(2) ENV_orientation	0.202	1.000									
(3) DEPTH_mkt	0.236	0.098	1.000								
(4) DEPTH_tech	0.276	0.146	0.751	1.000							
(5) BREADTH_mkt	0.280	0.081	0.441	0.376	1.000						
(6) BREADTH_tech	0.276	0.082	0.343	0.465	0.766	1.000					
(7) visibility	0.182	0.219	0.266	0.261	0.173	0.216	1.000				
(8) innovative_mi~t	0.026	0.103	0.141	0.130	0.113	0.115	0.260	1.000			
(9) women	0.186	0.048	0.078	0.022	0.068	0.021	0.041	-0.072	1.000		
(10) bep	0.080	0.085	0.071	-0.031	0.154	0.218	0.021	-0.051	-0.073	1.000	
(11) per_graduated_1	-0.075	-0.095	-0.022	-0.024	0.117	0.054	-0.064	0.027	0.195	0.022	1.000

3.3 Model Estimation

Considering that our dependent variables are far from being normally distributed, but included within predefined thresholds (from “0” to “6”), we adopt an estimation strategy based on an ordered logit model (for a similar approach see Sedita *et al.*, 2019).

Accordingly, ordered logit models have been developed with the goal of modelling the relative frequency distribution of cases when the possible outcome of Y is not dichotomous as in a standard logit, but distributed in three or more ranked categories (Greene, 2003). In our case, considering the building procedure of our dependent variables (sum of six dummies related to social and environmental practices/actions pursued by the startup), we cannot hypothesize a strict rank (as in the case of a scale), but a major orientation of the startup towards sustainability if all the six typologies of actions are carried out.

4. Results

The estimation of the ordered logit models, represented in tables 3 and 4, followed a stepwise approach⁴. In column 1 of table 3, we first estimated the model only with control variables, finding that gender diversity among employees (% of women) is significantly correlated (at 1%) with the startup’s capacity to adopt a social attitude. Columns 2 to 5 report results with the independent variables, market strategy and innovation attitude singularly tested with the control variables. In relation to the subcomponents of market strategy (Breadth) and Innovation attitude (Depth), we included two different variants, one related to market information and another to technical

⁴ As a robustness check we compute the estimations using Poisson models. The results report the same significance levels for the two independent variables.

information. We considered them different learning channels and we decided to test them separately to avoid multicollinearity issues. Concerning Market Strategy, we found a significant and positive effect (at 10%) of the Networking considering both the Breadth variable (the market type) and visibility. This can be interpreted as the importance, for the new venture, of being embedded in a wide relational ecosystem together with the acquisition/maintenance of a high-profile image can help to trigger the startup' capacity to be societally committed. In relation to Innovation attitude, we found out that the adoption of an open innovation paradigm (measured by technological Depth) is significantly correlated (at 1%) with the startup's capacity to adopt a social attitude. This can be interpreted as the possible exploitation of "*problem centered innovation networks*" (Eppinger, 2021:8) to orient the future goals of the startups towards a sustainable path creation. With the exception of visibility variables, the significance of variable reported in columns 2 to 5 are confirmed also in the complete specification of the model (columns 6 and 7), considering both market and technical versions of Breadth and Depth.

Tab. 3: Determinants of Social orientation (ordered logit models)

	(1) SOC_orient.	(2) SOC_orient.	(3) SOC_orient.	(4) SOC_orient.	(5) SOC_orient.	(6) SOC_orient.	(7) SOC_orient.
% women	1.525** (0.564)	1.542* (0.610)	1.711** (0.647)	1.471* (0.585)	1.561** (0.562)	1.486* (0.634)	1.662* (0.673)
bep	0.266 (0.285)	0.155 (0.285)	0.250 (0.285)	0.272 (0.287)	0.281 (0.287)	0.154 (0.287)	0.240 (0.289)
per_graduated_1	-0.625 (0.395)	-0.630 (0.383)	-0.576 (0.392)	-0.573 (0.387)	-0.627 (0.390)	-0.603 (0.380)	-0.552 (0.387)
geo_area_CENTRE	-0.0605 (0.420)	0.127 (0.403)	0.109 (0.414)	-0.137 (0.424)	-0.0258 (0.418)	0.0517 (0.420)	0.0555 (0.429)
geo_area_NORTH	-0.326 (0.371)	-0.0468 (0.363)	-0.0959 (0.361)	-0.333 (0.365)	-0.300 (0.369)	-0.0728 (0.371)	-0.112 (0.368)
DEPTH_mkt		0.216 ^{A°} (0.118)				0.186 (0.128)	
BREADTH_mkt		0.220 ^{A°} (0.123)				0.225 ^{A°} (0.125)	
DEPTH_tech			0.262** (0.0974)				0.241* (0.108)
BREADTH_tech			0.137 (0.100)				0.139 (0.101)
visibility				0.253 ^{A°} (0.134)		0.163 (0.162)	0.124 (0.167)
innovative_mindset					0.171 (0.251)	-0.0652 (0.271)	-0.0477 (0.274)
Observations	173	173	173	173	173	173	173
Pseudo R ²	0.017	0.037	0.042	0.022	0.018	0.039	0.043
Chi2	8.633	16.58	19.46	11.66	9.262	18.53	21.24
Log-likelihood	-278.6	-272.9	-271.4	-277.0	-278.4	-272.3	-271.1

Robust Standard errors in parentheses. ^{A°} $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In table 4 we report the same sequence of stepwise models, using as a dependent variable the environmental orientation of new ventures. In column 1, we do not report any significance among control variables. Considering the independent variables, we register a positive and significant influence of technological Depth for Innovation attitude and a strong effect of visibility within market strategy on the environmental orientation of the startups. However, only the latter (visibility)

maintains a solid significant effect also in the complete specification of the model (columns 6 and 7).

Tab. 4: Determinants of Environmental orientation (ordered logit models)

	(1) ENV_orient.	(2) ENV_orient.	(3) ENV_orient.	(4) ENV_orient.	(5) ENV_orient.	(6) ENV_orient.	(7) ENV_orient.
%women	0.775 (0.566)	0.679 (0.581)	0.701 (0.565)	0.708 (0.568)	0.793 (0.560)	0.673 (0.582)	0.669 (0.569)
bep	0.342 (0.277)	0.293 (0.283)	0.358 (0.305)	0.366 (0.287)	0.370 (0.285)	0.325 (0.295)	0.361 (0.315)
per_graduated_1	-0.459 (0.370)	-0.445 (0.374)	-0.422 (0.371)	-0.394 (0.386)	-0.467 (0.368)	-0.410 (0.394)	-0.376 (0.385)
geo_area_CENTRE	-0.620 (0.457)	-0.553 (0.456)	-0.519 (0.442)	-0.829 ^{A°} (0.449)	-0.583 (0.456)	-0.795 ^{A°} (0.466)	-0.727 (0.458)
geo_area_NORTH	-0.149 (0.403)	-0.0145 (0.411)	-0.00558 (0.390)	-0.138 (0.376)	-0.127 (0.404)	-0.0603 (0.393)	-0.0268 (0.380)
DEPTH_mkt		0.0731 (0.106)				0.00229 (0.112)	
BREADTH_mkt		0.104 (0.127)				0.102 (0.125)	
DEPTH_tech			0.158 ^{A°} (0.0907)				0.104 (0.0950)
BREADTH_tech			0.0566 (0.117)				0.0557 (0.113)
Visibility				0.463 ^{**} (0.146)		0.447 ^{**} (0.154)	0.413 ^{**} (0.154)
innovative_mindset					0.230 (0.234)	0.0104 (0.231)	0.0143 (0.238)
Observations	173	173	173	173	173	173	173
Pseudo R ²	0.011	0.015	0.019	0.029	0.013	0.031	0.033
Chi2	5.710	8.074	10.02	13.58	6.872	14.15	15.57
Log-likelihood	-274.8	-273.7	-272.5	-269.7	-274.3	-269.3	-268.6

Robust Standard errors in parentheses. ^{A°} $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5. Conclusions

With this paper, we contribute to the development of the literature that links technological entrepreneurship and sustainability. The two notions are more and more deeply intertwined in the design of a win-win scenario where the most promising resources and competencies of the digital economy are utilized to address global complex challenges (George *et al.*, 2021).

Preliminary findings confirm that mechanisms that support the sustainability behavior of digital-oriented startups are different for social and environmental spheres. Innovation Attitude seems to play a major role in the case of social orientation of ICT startups, in particular with the role of open innovation network aimed to share technical information. While Market Strategy seems to cover a key role in the case of the environmental attitude of ICT startups, in particular with the role of visibility, meant as the willingness of the new firm to self-promote itself.

On one side, the first finding, related to Innovation Attitude, can be received as a positive signal for societal development, considering: a) the growing importance of ICTs startups in the global panorama in terms of job creation and capabilities and b) the general extensive use of open innovation paradigms by these kinds of entities. Social-related externalities of open innovation can be furtherly investigated to disentangle what network configurations can support this, timing and territorial mediation effects.

On the other side, the second finding, related to, the specific influence of visibility on environmental orientation can cause some concerns, considering the high energy intensity of ICTs firms and the progressive presence of digitalized products. In this regard, environmental motivations not deeply rooted in the corporate culture, but driven only by temporal marketing purposes can be an aleatory road towards big green challenges. It follows that marketing efforts directed at delineating a green identity should be the tip of a wider iceberg made of concrete initiatives embedded in a long-term strategy. Recently, Chen et al (2015) introduced “eco-effectiveness” as a concept that brings the sustainability paradigm outside the borders of the focal firms, inducing a change in the systems of relations in which the firm is embedded. This notion is relevant for these results as the open innovation paradigm could be explored by future research as a trigger mechanism to drive strategies and actions with a green impact.

In addition to the results of the main independent variables, we unexpectedly found out the role of gender diversity among the determinants of the social orientation of startups. This result paves the way to further investigation for its possible consequences on the hiring policies of startups or the call for innovation aimed at social good.

Practical implications of the study can be found in the identification of specific underlying factors that may support the startup to invest in green/social policies, accelerating the mental shift towards sustainability. Of course, social and environmental spheres cover different aspects within a firm but are integrated into the paradigm of sustainability. Therefore, startups managers should integrate and balance social environmental strategies in their business model, considering also the initial lack of resources that generally affect newborn firms.

The research has some limitations. First, the study is geographically limited to Italy, future research agendas might include an examination of other national settings to see if the drivers of sustainability identified remain valid. Second, we focused on startups in the ICT industry. It will be fascinating to see if similar results hold looking at other sectors, comparing also the drivers of startups with those of incumbents.

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Unlocking the Potential of Professional Social Matching in Innovation Ecosystems: A Conceptual Framework and Research Agenda to Foster Local Interactions in Global Networks

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Abstract

Framing of the research. This paper contributes to the literature on strategic management and *entrepreneurship* by conceptualizing the use of professional social matching (PSM) systems to recommend and foster partnerships within innovation ecosystems. Innovation is increasingly dependent on the interactions between heterogeneous actors and spread across regional, national, and global networks. Hence, understanding who to collaborate with and where becomes fundamental to leverage all resources available locally and globally, and pursue sustainability-oriented innovations.

Purpose of the paper. By reviewing the most recent literature on the two topics, this paper drafts an initial framework and a research agenda on the use of PSM in multilocal and multiscale innovation ecosystems.

Methodology. Recent academic articles, conference papers, and book chapters were reviewed to identify the key features of both constructs. This information was employed to develop an original framework for Innovation Ecosystem Professional Social Matching Systems (IEPSMS) and outline a targeted research agenda.

Results. This paper shows that a PSM systems capable of balancing actor-level and ecosystem-level needs, of combining multiple data sources and recommendation methods, and of accounting for ecosystems' evolutions may be a valuable instrument for academics and practitioners interested in innovation.

Research limitations. This only constitutes a conceptual work and further empirical investigations are necessary to develop and test its conclusions.

Managerial implications. This paper may motivate ecosystem orchestrators to invest in an IEPSMS. This would facilitate interactions at the local level, as well as a prosperous evolution of the ecosystem within the global network of innovation relations. Ultimately, this would foster the competitiveness of organization and territories and their capacity to address complex sustainability challenges also in times of international uncertainty.

Originality of the paper. By conceptualizing the use of PSM in innovation ecosystems, this work opens new research opportunities for management and entrepreneurship scholars.

Keywords: professional social matching; innovation ecosystem; innovation partner; ecosystem orchestration; recommendation system; global innovation network

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1. Introduction

This paper contributes to the literature on strategic management and entrepreneurship by conceptualizing the use of professional social matching (PSM) systems to recommend and foster partnerships within innovation ecosystems. These literature streams investigate how organizations and individuals can create and capture value through innovative processes and practices. Since these processes have progressively expanded beyond the organizations' own boundaries (Moore, 1993; Chesbrough *et al.*, 2014), academics and practitioners have displayed a growing interest in the role of ecosystems in the creation and diffusion of innovation (Carida' Angela *et al.*, 2018; Abbate *et al.*, 2019; Modina *et al.*, 2022). Indeed, innovation is increasingly dependent on the interactions between heterogeneous actors (Suominen *et al.*, 2019) spread across regional, national, and global networks (Binz *et al.*, 2014). Hence, organizations are increasingly focused on accessing tangible and intangible resources dispersed across organizations and locations (Colurcio and Russo-Spe, 2013; Malerba and McKelvey, 2020). These dynamics have become particularly evident and problematic in the last few years, as the Covid-19 pandemic and the growing international uncertainty have exposed the intricacy of these global networks (Mazutis *et al.*, 2021; Bathelt and Li, 2022). Moreover, accounting for them would be crucial to efficiently leverage all locally and globally available resources to address the most pressing sustainability challenges, and to foster the competitiveness of organizations and territories (Carayannis *et al.*, 2018; Ferraris Alberto and Grieco Cecilia, 2018; Soderstrom and Weber, 2020).

In face of a similar managerial complexity, fostering valuable interactions between innovation actors becomes crucial, though challenging for several reasons. First, innovation ecosystems often comprise a large and diverse range of actors, such as universities, firms, public organizations, and civil society groups (Martin, 2014; Kivimaa and Mattila, 2015). Second, they are often split into disciplinary or organizational communities who speak different epistemic languages (Markowski, 2022). Third, actors are located in different regions or countries, further increasing their distance in geographical, linguistic, culture, or normative terms (Prainsack 2012; Binz *et al.*, 2014; Mazutis *et al.*, 2021). While this diversity often nurtures creativity and innovation, it is also an obstacle to the construction of new partnerships as distant actors have lower opportunities to interact and transactions costs are higher (Orsatti *et al.*, 2020; Paula and de Macedo-Soares, 2022). Since actors in innovation ecosystems possess different resources and capabilities that each organization is interested in capturing, two key aspects must be considered when choosing the right innovation partner: first, it should be sufficiently different and distant to provide complementary assets and, second, it should be sufficiently similar and socially close to enable easy collaboration (Powell 1990; Amin and Roberts 2008; Gallié *et al.*, 2013). In doing so, organizations also strive to maximise their absorption of external knowledge without losing excessive knowledge to competing organizations and territories (Quitow, 2015).

Despite the increasing importance of effective collaborations in innovation ecosystems, there is a gap in understanding how to best identify, cultivate and leverage them (Prainsack 2012; Malerba *et al.*, 2015). On the one hand, approaches to matchmaking and network formation are often ad-hoc and rely on personal relationships, homophily, and reputation, rather than systematic and data-driven methods (Kogut and Zander, 1992; Gulati, 1995; Olsson *et al.*, 2020). On the other, not only individual organizations are interested in building fruitful collaborations with peers, but multiple public and private actors are increasingly interested in fostering local interactions and ecosystem's performance (Sternad *et al.*, 2017; Parida *et al.*, 2019; Thomas *et al.*, 2021). Moreover, given the international uncertainty, these actors are increasingly concerned with avoiding that local knowledge spills over from their ecosystem to foreign businesses and countries (Binz and Truffer, 2017; The Economist, 2023).

To address these gaps, the purpose of the present conceptual paper is to review the most recent literature on the use of PSM in innovation ecosystems and to draft an initial framework and a research agenda on the topic. As a conceptual paper, rather than providing a comprehensive review of all available publications, it synthesizes just enough material on PSM and innovation ecosystems

to highlight the commonalities among the two constructs (Van de Ven, 1989). Then, following a creative and iterative approach (Weick, 1989), it bridges the two literature streams in an original framework (Gilson and Goldberg, 2015). By conceptualizing an Innovation Ecosystem Professional Social Matching System (IEPSMS), this work opens new research opportunities for management and entrepreneurship scholars and offers insights to practitioners interested in advancing the use of PSM in this context.

Indeed, these systems use information and communication technologies to match individuals and organizations with complementary skills, resources, and needs. The use of these systems has been shown to increase the efficiency and effectiveness of partnerships and collaborations, as well as to enhance opportunities for networking, knowledge sharing, and resource sharing. While multiple technical, ethical, and practical challenges remain to be addressed, PSM may significantly contribute to the innovation of organizations and entire ecosystems (Zytka and DeVreugd, 2019; Olsson *et al.*, 2020) and to addressing wicked problems (Mair *et al.*, 2016; Spinazzola and Cavalli, 2022).

This paper makes several contributions to the literature on strategic management and entrepreneurship by providing a concise and targeted review of the most recent literature on PSM and innovation ecosystems and developing an original and innovative framework for this goal. The IEPSMS framework enhances existing PSM approaches in a few ways. Firstly, by focusing on specific ecosystems, it enables the combination of various quantitative and qualitative data and methods (Qi *et al.*, 2022), thus improving accuracy. Secondly, it builds upon the concept of actors' complementarity (Rodan and Galunic, 2004), addressing the need for PSM systems that overcome, rather than inherit, human biases from existing social matching systems and social flows (Olsson *et al.*, 2020). Thirdly, the framework prioritizes the prosperity of the entire ecosystem, viewing recommendations as a cumulative and iterative process rather than one-time activities (Barabási and Albert, 2011; Olsson *et al.*, 2020). This feature is crucial for translating on-paper concepts into real-world applications, as well as for enabling orchestrators to strategize local interactions within global innovation networks (Addo, 2022). Lastly, by continuously collecting data on the ecosystem's interactions and comparing them to its recommendations, the IEPSMS is itself capable of evolution and learning, thus providing better recommendations over time (Iansiti and Lakhani, 2020; Pironti and Spinazzola, 2022).

Accordingly, a research agenda for IEPSMS can be outlined. Key specific issues include the definition and measurement of complementarity and efficiency in collaborations (Qi *et al.*, 2022), the conceptualization and study of ecosystems' complexity and evolution (Nelson and Winter, 2002; Mack and Mayer, 2016), and most importantly the definition of ecosystem-level optimizations (Tran *et al.*, 2016; Ionescu and Vernic, 2021). Additionally, it is important to investigate the issues of trust and motivations of ecosystem actors (Terveen and McDonald, 2005), data availability and lawfulness (Huhtamäki and Olsson, 2018; Mancosu and Vegetti, 2020), which are fundamental for the adoption of PSM systems. By addressing these challenges and issues, researchers can further develop and improve the IEPSMS framework, which has the potential to be a valuable tool for fostering innovation and prosperity in various ecosystems.

Ultimately, this paper may motivate ecosystem orchestrators to invest in an IEPSMS. This would facilitate valuable innovation interactions at the local level, as well as a prosperous evolution of the ecosystem within the global network of innovation relations. This would foster the competitiveness of organization and territories and their capacity to address complex sustainability challenges also in times of international uncertainty (Attig and Brockman, 2017; Bathelt and Li, 2022).

The paper is organized into several sections. First, a brief overview on innovation ecosystems and innovation partnerships from the literature of strategic management and entrepreneurship is provided. Second, from the information systems literature, a review of the most recent advancements in the use of PSM is presented. Third, an initial framework for the use of PSM in innovation ecosystems is drafted. Fourth, an agenda for the study of IEPSMS and their use in innovation ecosystems is drawn, before providing a conclusion of the paper with the key take-home messages and implications.

2. Innovation ecosystems

Innovation ecosystems are complex networks of actors, typically firms, universities, research institutions, government agencies, and other organizations, that interact to develop, disseminate, and commercialize new products, services, and technologies (Suominen *et al.*, 2019). Thought actors adopt a combination of collaborative and competitive behaviors (Iansiti and Levien, 2004; Theodoraki *et al.*, 2022), innovation ecosystems are characterized by a high degree of interdependence and co-evolution among actors, from which their emergence, sustainability, and prosperity ultimately depends (Iansiti and Levien, 2004; Carayannis *et al.*, 2018).

This concept has been approached from a variety of academic perspectives. Evolutionary economics, for example, focuses on the role of innovation in driving economic growth and change, and the evolving nature of innovation ecosystems. Studies in this field have primarily investigated the composition and structure of innovation ecosystems, particularly focusing on the identification of topologies, on longitudinal evolutions, and on the role of orchestrating actors, primarily governments and corporate players, in steering the evolution of innovation ecosystems towards desired directions (Nelson and Winter, 2002; Mack and Mayer, 2016; Dedehayir *et al.*, 2018). A similar approach has also been taken by the research on innovation systems, from which the concept of innovation ecosystems largely descends. This literature stream studies the complex interactions and relationships between different actors within a specific setting, such as a region, a country, or an industry, and how these interactions cumulatively support innovation (Binz *et al.*, 2014; Suominen *et al.*, 2019).

Conversely, the literature on strategic management and entrepreneurship has approached innovation ecosystems from the perspective of individual firms. One key antecedent is considered the concept of business ecosystem, in which companies interact to develop complementary products or services, and compete to capture value (Moore, 1993). This is particularly true in the case of business platforms, where generally one player orchestrates others to develop products and services complementary to its own (Foros *et al.*, 2013), but applies also to government or university-sponsored innovation ecosystems (Thomas *et al.*, 2021; Addo, 2022), and particularly for the development of sustainability-oriented innovations (Quitow, 2015). Indeed, this literature has been increasingly recognizing also the contribution of non-business actors, interpreting entrepreneurship as a distributed and collective activity, highly dependent on the availability of resources in the environment (Theodoraki *et al.*, 2018; Marchesani *et al.*, 2022). In this perspective, material and immaterial assets, and particularly knowledge, are similar to abiotic resources available in natural ecosystems (Stam and Spigel, 2016). As natural species metabolize these resources to develop and replicate, so do organizations in innovation ecosystems as they combine them to generate new knowledge, products, and services, which ultimately nurture back the local humus (Carayannis *et al.*, 2018; Stam and van de Ven, 2021).

These resources are accessed thanks to existing relations with other organizations in the network, which businesses actively explore to identify complimentary assets to their own (Carayannis *et al.*, 2018; Malerba and McKelvey, 2020). This is particularly salient for knowledge, as it constitutes the primal resource for any innovation, is extremely challenging to copy from competitors, but can be shared at almost no marginal cost (Rohrbeck *et al.*, 2009; Chesbrough *et al.*, 2014). Drawing from the innovation networks literature, this web of relations is often multilocal and multiscalar, as organizations share resources across geographical boundaries and industrial or disciplinary communities, and aggregate in clusters of more closely connected organizations (Etzkowitz and Zhou, 2006; Carayannis *et al.*, 2018; Xu *et al.*, 2018). Since access to new resources depends on the connections that a specific organization has with others as well as on the connections that they have, not all organizations display equal opportunities for accessing and exploiting knowledge and other assets. This fact has determined an increasing interest in the study of ecosystem networks, as key predictors of the opportunities available to each actor to access new resources and, to some extent, steer the ecosystem itself (Mele *et al.*, 2010; Hurmelinna-Laukkanen and Nätti, 2018; Ritala *et al.*, 2022).

For instance, actors strongly embedded in the network of collaborations have the highest chances of orchestrating activities of others, as well of accessing knowledge produced within the network via spill overs (Kadushin, 2002; Gudmundsson and Lechner, 2006). Conversely, actors connecting otherwise separate clusters may work as bridges. This would give them access to more diverse resources and control over knowledge flow between the clusters (Burt, 1995; Hoegl and Schulze, 2005). Both roles may be interpreted for more short-term or long-term strategies and goals: businesses are more likely to seek brokering positions that give them opportunities for accessing and exploiting knowledge while other, often public, actors may be interested in solely facilitating knowledge flow to achieve larger societal benefits (Benneworth *et al.*, 2009; Rohrbeck *et al.*, 2009; Chesbrough *et al.*, 2014; Pugh *et al.*, 2016; Ma *et al.*, 2019). In the first scenario, bridging positions would be particularly beneficial in the early stages of the development of an innovation and for knowledge exploration, while more central positions would be advantageous during its more mature development for knowledge exploitation (Burt 2001; Grenfell 2008; Wang *et al.*, 2020). On the contrary, in the case of long-term strategies, bringing positions would be ideal for connecting otherwise distant actors and favour knowledge and technology transfer, while orchestrating positions would be best for steering the innovation process also by distributing resources and labour across organizations (Oinas and Malecki, 2002; Wright *et al.*, 2008; Chen *et al.*, 2015; Thomas *et al.*, 2021).

Accordingly, the structure of the collaboration network becomes crucial to determine the opportunities of individual organizations to access valuable resources in the ecosystem, as well as to determine the evolution of the ecosystem itself (Xu *et al.*, 2018). While originating from a focus on regional and national systems of innovation, the concept is being employed to describe global phenomena (Del Giudice *et al.*, 2017). Indeed, local innovation ecosystems are increasingly connected to each other as actors embedded in a strong network in the Region A are also, though more weakly, connected to actors participating in the innovation ecosystem of Region B. This is often the result of the transnational collaborations interwoven by multinational companies and universities, thus making them key players in the emergence of a multiscalar and multilocal innovation ecosystems (Binz *et al.*, 2014; Del Giudice *et al.*, 2017), and ultimately motivating researchers to adopt a geography and scale agnostic perspective (Binz *et al.*, 2014; Carayannis *et al.*, 2018). These bridging positions allow organizations to access more diverse knowledge and acts as brokers between different locations (Malerba and McKelvey, 2020). While it may ultimately benefit all bridged ecosystems (Chen *et al.*, 2015; Ritala *et al.*, 2022), as already mentioned, it may also result in undesired appropriations of local resources and knowledge by foreign actors (Quitow, 2015; Binz and Truffer, 2017).

In fact, the concept of innovation ecosystem has been increasingly employed also by governments as a general paradigm to drive and support innovation and growth. On the one hand, governments are increasingly focusing their attention on sustainability-oriented technologies, products, and services. As they try to address complex and wicked challenges for which uncertainty abounds and no clear understanding is available, engaging actors with the widest range possible of expertise and assets becomes crucial (Carayannis *et al.*, 2012). Moreover, these actors would be responsible not only for developing a new technology, but also for adopting and scaling it up quickly so as to avoid potential mismatches between available technologies and industry or societal needs (Adner, 2006). Last, as the ecosystem concept highlights, these actors would not only provide complementary resources and provide opportunities for iterative development and use of technologies, but also co-evolve over time organizing themselves in fruitful and complementary relations (Carayannis *et al.*, 2018; Gifford *et al.*, 2021). However, favouring the collaborations that would best achieve these objectives while preserving the competitive advantage of local ecosystems remains challenging.

3. Finding innovation partners

As already mentioned, innovation is increasingly recognized as a collaborative effort. While multiple explanations have been proposed, key factor can be found in the increasing dispersion of knowledge across, disciplines, organizations and workers (Jones 2009; Agrawal *et al.*, 2016), in the increasing complexity of the problems to be addressed (Arora and Gambardella 1994; Harvey *et al.*, 2014), and in the benefits arising when creatives from different personal and professional backgrounds work together (Kauffman, 1992; Caminati, 2006). This appears particularly true in the case of sustainable technologies, as they try to address complex challenges but often result from combining already available knowledge rather than from producing new radical one (Colombelli and Quatraro, 2019; Orsatti *et al.*, 2020). Accordingly, innovation would benefit not only from having access to sufficiently diverse knowledge and complementary assets, but also from the social interaction of innovation partners and workers, as a booster of the organization's capacity to absorb new knowledge and effectively recombine it (Dahlin *et al.*, 2005; Carnabuci and Operti 2013).

Accordingly, the literature on strategic and innovation management has been placing much emphasis on collaborations, for instance across industries (Harvey *et al.*, 2014), across borders (Zhong *et al.*, 2022), across disciplines (Markowski, 2022), and between different types of actors, such as academia and businesses (Miller *et al.*, 2018) or between corporates and startups (Ching and Caetano, 2021). Ultimately, collaborations are expected to lower risks, foster competitiveness (Chesbrough *et al.*, 2014; Ghezzi *et al.*, 2022), and enable the development and commercialization of complementary products and services (Konietzko *et al.*, 2020; Gifford *et al.*, 2021).

While collaborative innovation seems generally desirable, it is far from easy. Innovation ecosystems comprise a large and diverse range of actors (Martin, 2014; Kivimaa and Mattila, 2015), who speak different epistemic languages (Markowski, 2022), and differ by geographical, linguistic, culture, and normative terms (Prainsack 2012; Binz *et al.*, 2014; Mazutis *et al.*, 2021). As already mentioned, this diversity nurtures creativity and innovation, but may also hamper them (Orsatti *et al.*, 2020; Paula and de Macedo-Soares, 2022). On the one hand, it increases organizational complexity, slows activities and processes, and may open to undesired spill overs to competitors (Bernal *et al.*, 2022). Most importantly, it may result in failures. This is particularly true when internal diversity is too wide and the costs of establishing an effective communication are higher than the leveraged benefits (Mukhtar and Gebrekidan, 2017; Konietzko *et al.*, 2020). Another issue relates to the possibility of free-riding behaviours, particularly when partnerships aren't sustained by effective governance arrangements or when the actors involved do not participate in a same social network and believe their relation to be sporadic, hence enacting short-term maximisation policies (Archibugi and Filippetti, 2015; Li and Jian, 2022). Accordingly, a number of collaborations actually fail or provide suboptimal outputs (Zineldin *et al.*, 2015; Mukhtar and Gebrekidan, 2017).

Aware of these issues, innovation managers actively search for innovation partners that maximise diversity and provide complementary resources, while at the same time being sufficiently similar to one-self to minimize costs and failures (Olsson *et al.*, 2020). However, approaches to matchmaking and network formation are still rudimental. They often rely on personal relationships, reputation and opportunity, rather than systematic and data-driven methods (Kogut and Zander, 1992; Gulati, 1995; Olsson *et al.*, 2020). When more systematic, they employ questionnaires to map availability of resources and goals across organizations and brokering from specialized ecosystem or industry experts (Carayannis *et al.*, 2000; Rajalo and Vadi, 2021). While these approaches may provide accurate suggestions for collaborations, however, they remain severely limited by the limited capacity of humans to analyse large amounts of data and to keep track of existing collaborations, as well as by a-priori assumptions on the extension of the ecosystem itself. Hence, individual organizations may miss valuable innovation partners in their ecosystem, and orchestrators may miss the opportunity to develop targeted policies and instruments for partnership building, thus focusing on traditional instruments such as funding, science parks, and public-private partnerships (Del Vecchio *et al.*, 2017; De Bernardi and Azucar, 2020). Given the limitations of

data and computational power available to organizations, particularly smaller ones such as small-medium enterprises and startups, recognizing when and with whom external to the local ecosystem build a partnership results particularly challenging, hence increasing exposure to the global network of collaborations or forcing protectionist behaviors (Leijten, 2019; Wennberg and Sandstrom, 2022). PSM may support addressing some of these issues.

4. Professional social matching

The concept of PSM has recently emerged in the information systems literature as an instrument to recommend professionally relevant matches, whether to foster collaborations between academics (Archer and Zytka, 2019), to recruit new employers for a specific team or company (Faliagka, 2012), or identify ideal partnering organizations (Cai *et al.*, 2019). Specifically, it uses algorithms to match individuals or organizations based on their professional characteristics, such as skills, experience, interests, sector, or location, but also accounts for the network structure to provide recommendations (Qi *et al.*, 2022).

The concept of PSM has been around for several years, but it has become increasingly relevant with the rise of professional networking platforms such as LinkedIn. Nonetheless, from an academic perspective, it still remains largely under-theorized (Olsson *et al.*, 2020). While only a few papers explicitly referencing the topic have been published, it is possible to find roots of this concept in existing literature streams. On the one hand, the concept relates to the problem of finding the right collaboration partner, typically for innovation or business purposes, and has hence been extensively presented in the previous section. On the other, and most importantly, the concept draws from the literature on social matching systems and, at large, on recommendation systems.

Recommendation systems have emerged in the last decades to address a key problem of this time, meaning the over abundance of information and the impossibility to systematically review it all prior to taking decision (Terveen and McDonald, 2005). Recommendation systems have been used to recommend consumers with products such as books, movies, and items from shops on-line and streaming platforms for many years now, but widespread tools such as Google Search also fall into this category (Olakanmi and Odeyemi, 2021; Khan *et al.*, 2022). First, they assume that people may be interested in products similar to those they already possess or have searched for and, two, they assume that people may be interested in products similar to those that other people are interested in as long as socially connected (Bobadilla *et al.*, 2013).

Most recently, the focus has shifted from products to people, as social matching systems have emerged as a specific sub-category of recommending systems largely used in social networks and dating apps (Nayak *et al.*, 2010). What these two applications have in common is that they host personal pages for each user and employ information on them and on the structure of the network they are embedded in to recommend new connections (LinkedIn, 2022; Tinder n.d.). As for previous recommending systems, social matching systems are based on the idea that individuals are more likely to be compatible if they share similar interests or have shared connections, thus enhancing the social experience of users and improving the quality of online interactions. PSM constitutes a specific application of social matching systems to the vocational domain, and rely on a similar number of methodological approaches (Terveen and McDonald, 2005).

There are several quantitative methods for PSM in the information systems literature, mostly relying on the use of bibliometric and patent information as primal material (Qi *et al.*, 2022). One approach is to rely on synthetic indicators representative of organizations' propensity to innovation and collaboration, and then match potential partners according to priority rankings (Geum *et al.*, 2013). Alternatively, citations and collaboration information have been widely used to map networks of collaborating organizations or individuals, drawing on link prediction algorithms and triadic closure principles to identify partnerships most likely to emerge in the future due to historical interaction (Yan and Guns, 2014; Chen *et al.*, 2021). Additionally, patents and scholarly articles have been mined with Natural Language Processing (NLP) techniques to extract insights

from the content of these documents, and then use various algorithms to recommend collaborations according to content similarity (Jeon *et al.*, 2011; Wang *et al.*, 2017). Most recently, these methodologies have been combined to account for both the structure of the network, the thematic affinity of actors, and the different innovation roles that actors may play (Park *et al.*, 2015; Ding and Guo, 2021).

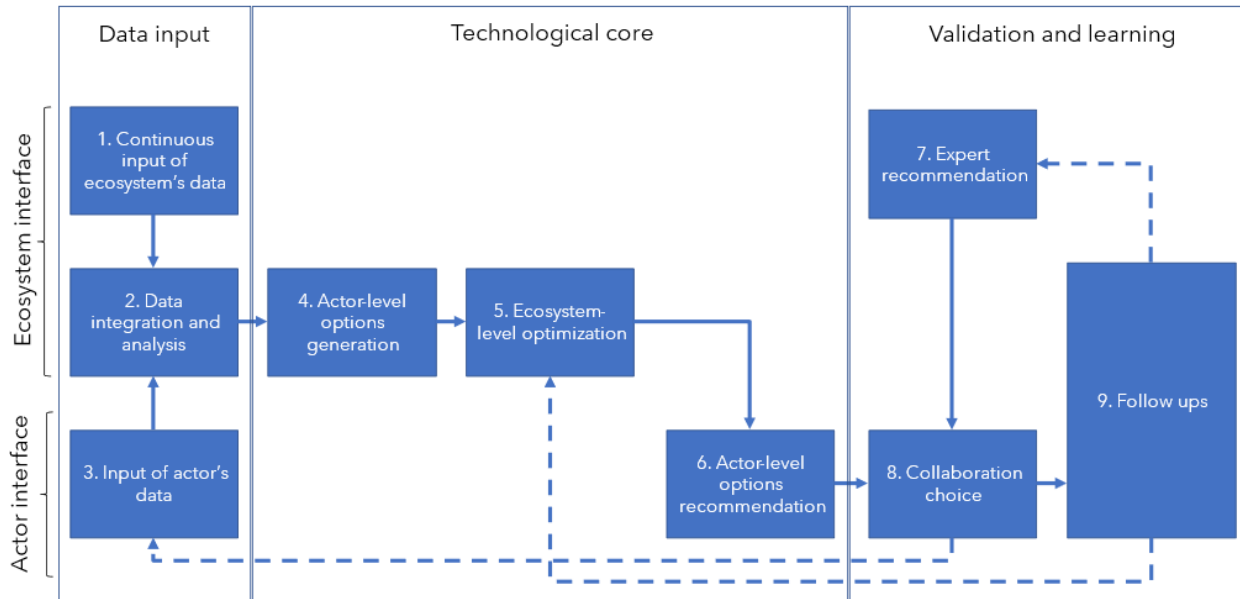
Each of these methods has its own strengths and weaknesses and the choice of method depends on the goals and constraints of the PSM system. Algorithmic matching, for example, may provide quick and efficient matches but may not consider personal preferences or cultural differences. Expert-based matching, on the other hand, may provide more accurate matches but may be more time-consuming and resource-intensive. While the choice of method should be based on a thorough analysis of the goals and constraints of the PSM system and the resources available to support it, it is increasingly acknowledged that effective systems should leverage a combination of these approaches (Qi *et al.*, 2022).

Ultimately, these systems provide increased networking opportunities, facilitate hiring and recruitment, expanded opportunities to accessing knowledge and skills, and favour collaboration and innovation (Qi *et al.*, 2022). However, multiple challenges still remain. First, recommendations may be severely biased, as the algorithms used to make recommendations may be influenced by factors such as gender, race, or socioeconomic status embedded in the data (Li *et al.*, 2016). Additionally, PSM can also lead to homogenous network formation, as individuals would be more likely to connect with those who are similar to them. Indeed, these systems have been designed to rely on homophily to suggest new recommendations and, hence, they may strengthen existing patterns rather than opening new opportunities by finding complementary actors (Olsson *et al.*, 2020). Moreover, privacy and data security are major concerns for PSM platforms, as they require users to share sensitive personal and professional information. This information can be vulnerable to cyberattacks, data breaches, and misuse. This is particularly true when information is not deliberately shared with the system but rather obtained with scraping methods from the web, a practice whose lawfulness is still problematic both for what concerns the respect of websites' terms of services and of privacy rules (Mancosu and Vegetti, 2020). Another aspect is the potential lack of trust in such systems, as users may be concerned about the accuracy of recommendations (Terveen and McDonald, 2005). Last, as already mentioned, existing systems are primarily intended to maximize, though with limitations and biases, individual-level matchings rather than of the entire community. This aspect motivates the present article to investigate the use of PSM in innovation ecosystem (Olsson *et al.*, 2020).

5. Innovation Ecosystem Professional Social Matching Systems

Considering the key features of innovation ecosystems and existing approaches to PSM, a conceptual framework for an IEPSM can be drafted (Figure 1). To a large extent, it leverages features of already existing systems for PSM (Cai *et al.*, 2019; Qi *et al.*, 2022), but some key aspects specific to its use in innovation ecosystems have been designed and added. The framework is organized around two dimensions. First, on the horizontal axis, three functional sections can be distinguished, and namely Data input, Technological core, and Validation and learning. Conversely, on the vertical axis, two scalar dimensions can be recognized: while the Ecosystem-level interface gathers all back office and technical activities, and is managed by the ecosystem orchestrator, the Actor-level interface is available to all ecosystem actors to explore their positioning in the ecosystem and actively search for new collaborations. Third, nine ordered activities are organized along the two dimensions and connected by arrows to more easily understand how the system works, indicating feedback mechanisms via dashed ones.

Fig. 1: Professional social matching framework for innovation ecosystems



Source: own work

Following a strictly logical order, the framework is now presented:

1. Continuous input of ecosystem's data: first, data from multiple publicly available sources is collected via automatic and semi-automatic processes, such as web scraping. Typical data sources include scholarly publications, patents, social networks, and public registries. Data is periodically collected to keep the system updated (Xu *et al.*, 2018; Kinne and Axenbeck, 2020).
2. Data integration and analysis: then, this data is normalized, processed to overcome disambiguation, and integrated to link each actor to relevant material. This data is also analysed with NLP and network analysis techniques to provide a first representation of the innovation ecosystem, accessible to the ecosystem orchestrator (Jeon *et al.*, 2011; Xuefeng *et al.*, 2015; Kang *et al.*, 2019).
3. Input of actor's data: once an actor (hereafter Company X) is interested in exploring its positioning in the ecosystem or searching for a suitable innovation partner, it interacts with the front end of the IEPSMS (e.g. a public website) by providing key information about itself, such as the topics of interests and existing collaborations. This enables to validate the preliminary representation of the ecosystem and to enrich it with additional data (Cai *et al.*, 2019).
4. Actor-level options generation: subsequently, existing approaches to PSM, including NLP and network analysis, are combined to provide recommendation options to Company X. These options aim to maximise complementarity and efficiency (Qi *et al.*, 2022). These options, however, are not yet shared.
5. Ecosystem-level optimization: at this point, the top options generated at the previous step are evaluated according to their impact on the structure of the ecosystem. For simplicity, ecosystem-level optimization may follow the same principles of actor-level recommendation, or rely on dedicated algorithms (Ionescu and Vernic, 2021; Kaufmann *et al.*, 2021). It is worth noticing that the ecosystem orchestrator would be demanded to choose the boundaries of the ecosystem in order to identify the relations to optimize (Konietzko *et al.*, 2020).
6. Actor-level options recommendation: at this point, a subset of options resulting from step 4 and step 5 would be provided to Company X, accompanied by estimations of the impact of a new collaboration on the structure of the ecosystem. This would enable Company X to consider all available information for a solid choice, avoiding black-box situations (Qi *et al.*, 2022).
7. Expert recommendation: drawing on knowledge of the IEPSMS, of the innovation ecosystem, and the specific sector, experts from the orchestrating organization would complement the

automatically generated recommendations with a qualitative assessment and suggestions to Company X (Crupi *et al.*, 2020).

8. Collaboration choice: at this point, Company X chooses one or multiple potential collaboration partners. The IEPSMS provides reach-out contacts for each organization so as to monitor any in-platform communication. Nonetheless, it is most likely that communications would happen out of sight.
9. Follow-ups: at fixed times, data on the new collaboration launched by Company X as well as on the evolution of the ecosystem are collected, comparing them to the recommended collaborations. This allows to have updated data on Company X, to improve expert's recommendations, and to improve the ecosystem-level optimization, possibly with the implementation of machine learning instruments.

This framework fosters existing frameworks for PSM in several ways. First, it combines multiple methods for PSM, including quantitative and qualitative expert-based ones. This is possible thanks to the focus on a specific ecosystem (e.g. a region or a country) which enables the specialization of a supporting staff. Second, it further develops the concept of actors' complementarity, thus answering for the call for PSM systems that overcome human biases rather than inheriting them from existing social matching systems and social flows (Qi *et al.*, 2022). Third, this framework accounts for the prosperity of the entire ecosystem rather than of the individual organization. Hence, it does not see recommendations as one-time activities, but rather as cumulative and iterative processes. This feature is fundamental to go beyond on-paper concepts and develop real-world applications, as well as to enable orchestrators to accurately strategize the evolution of the ecosystem and its connection with the global innovation networks (Qi *et al.*, 2022; Ritala *et al.*, 2022). Last, as the ecosystem evolves so does the IEPSMS: by continuously collecting data on the ecosystem evolution and comparing it to the provided recommendations, it learns to predict how actors would behave and how to provide more effective recommendation (Iansiti and Lakhani, 2020; Pironti and Spinazzola, 2022).

6. Research agenda

Drawing on the presented framework, a research agenda of the use IEPSMS can be outlined. First, Complementarity and efficiency, complexity and evolution, and ecosystem-level optimizations are discussed as key specific challenges for IEPSMS, then followed by a number of issues already acknowledged in the literature on PSM but still of great relevance.

Complementarity and efficiency: as the concept of innovation ecosystem strongly highlights the importance of complementary assets, products, and services, even more than for other uses of PSM assessing the complementarity of two actors becomes crucial. However, as of today there is paucity quantitative approaches to measure complementarity in the PSM literature (Olsson *et al.*, 2020). While one approach could be to focus on the complexity of knowledge provided (Hausmann *et al.*, 2014), or the complementarity of ecosystem functions (Xu *et al.*, 2018), additional research is required to understand what additional variables could be considered. Most importantly, focus on complementarity would require identifying adequate algorithms to combine multiple variables, as well as to balance complementarity with efficiency, as excessively distant actors may be highly complementary but new collaborations would also be excessively costly.

Complexity and evolution: more than in other interpretations of innovation networks, the concept of innovation ecosystem is grounded in the complex systems and complex adaptive systems literature (Carayannis *et al.*, 2018). Accordingly, the dynamic nature of collaborations must be acknowledged and measured, particularly considering the evolution of the network over time. Hence, a continuous collection of network data and follow ups would enable to study such evolution in real time, and to improve the algorithms for the recommendation system, and particularly those concerned with ecosystem-level optimization (Qi *et al.*, 2022).

Ecosystem-level optimisation: this is possibly the most challenging aspect which remains largely unexplored in this field. At least two aspects must be investigated: one, the meaning of ecosystem-level optimization must be further explored, defined, and theoretically grounded. This requires deep-delving into the literature of complexity theory, and particularly on nested complex systems (Walloth, 2016; Carayannis *et al.*, 2018). On the other, this concept must be further operationalized and adequate methodologies to assess it must be tested. Examples include the adoption multi-objective optimization or free-energy minimizations algorithms (Ionescu and Vernic, 2021; Kaufmann *et al.*, 2021).

Moreover, scholars should keep investigating topics such as trust and motivations of ecosystem actors (Terveen and McDonald, 2005), data availability and legality (Huhtamäki and Olsson, 2018; Mancosu and Vegetti, 2020), as fundamental for any PSM systems.

7. Conclusions

This paper contributes to the literature on strategic management and entrepreneurship by exploring the use of PSM systems to recommend and foster partnerships within innovation ecosystems. Innovation has expanded beyond organizations' boundaries and become increasingly dependent on the collaboration of heterogeneous actors spread across regional, national, and global networks. Hence, understanding who to collaborate with and where becomes fundamental to leverage all resources available locally and globally, and pursue sustainability-oriented innovations (Binz *et al.*, 2014; Del Giudice *et al.*, 2017; Carayannis *et al.*, 2018).

By synthesizing the most recent publications on PSM and innovation ecosystems, this work highlighted the commonalities among the two constructs (Van de Ven, 1989) and bridged the two literature streams in an original framework (Gilson and Goldberg, 2015). Indeed, the proposed IEPSMS framework identifies the key features that a PSM system should have to be relevant in an innovation ecosystem, and namely: balance actor-level and ecosystem-level needs, combine multiple data sources and recommendation methods, and account for ecosystems' evolutions. Accordingly, a research agenda for further investigation into the use of PSM in multilocal and multiscale innovation ecosystems was elaborated, placing particular emphasis on complementarity and efficiency, complexity and evolution, and ecosystem-level optimization.

This only constitutes a conceptual work, and further empirical investigations are necessary to develop and test its conclusions. Nonetheless, this paper provides the first conceptualization of PSM in innovation ecosystems, opening new theoretical and empirical opportunities for management and entrepreneurship scholars, but also for researches interested in information systems, evolutionary economics, and complexity theory. Additionally, as actors seek valuable collaboration partners to access tangible and intangible resources dispersed across organizations and locations, this framework may support their effort to identify the best matches from a multiplicity of perspectives, also accounting for the complexity of these global networks (Binz *et al.*, 2014; Malerba and McKelvey, 2020). Moreover, it may motivate ecosystem orchestrators to invest in an IEPSMS, facilitating valuable innovation interactions at the local level and fostering the competitiveness of organization and territories (Parida *et al.*, 2019; Addo, 2022). Ultimately, this would strengthen their capacity to collaborate, develop sustainability-oriented innovations, and manage international uncertainty (Bathelt and Li, 2022).

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Wellbeing and Sustainability in the Marketing literature: a Bibliometric Approach

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Abstract

Framing of the research. *This study analyzes the relationship between the concept of wellbeing and sustainability as it emerges from marketing studies. Wellbeing is a multidimensional concept and its relevance increases its possible applications thus making it one of the most interesting topics for scholars and practitioners.*

Purpose of the paper. *Understand the evolution of marketing studies on the theme of wellbeing and sustainability. The analysis of the scientific literature conducted allows us to identify possible future research trends in the field.*

Methodology. *This work makes use of a bibliometric analysis conducted on the international scientific literature published in the last 25 years.*

Results. *Three main clusters emerge from the analysis of the articles focused on wellbeing and sustainability: the managerial dimension, which relates to the customer, and, finally, the ethical one.*

Research limitations. *The analysis adopts a very specific but also very limited research scope: a future extension of the sample size of the studies analyzed and of the multidisciplinary perspectives could lead to broader and more comprehensive results.*

Managerial implications. *The implications of this study concern 3 targets: (a) marketing scholars who can obtain useful indications on publishing strategies for the future not adequately explored in the past; (b) managers who enrich their interpretative levers of value generation for their customers; (c) policymakers who acquire useful insights to design policies capable of increasing the well-being of their societies.*

Originality of the paper. *The scientific literature on wellbeing and sustainability is as florid as it is fragmented. This systematic analysis provides an overview of this concept in the discipline of marketing. This study also provides important indications of the interdisciplinary development that the topics under analysis are experiencing.*

Keywords: *wellbeing, sustainability, bibliometric analysis*

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Introduction

Exploring consumption motivations has always been a central mission in marketing studies. Consequently, it is not surprising that the most comprehensive and profound motivation of human action - namely wellbeing - has also entered marketing studies after an investigation in various fields such as psychology, sociology, medicine, and philosophy. Customers are demanding, with infinite hunger (Galgano, 2002).

Wellbeing is a multidimensional construct embracing multiple disciplines, encompassing both an objective - i.e. functional facet of value - as well as a subjective dimension (Diener, 1984). Nowadays, it is commonly regarded as the main KPI for economic and social development, lying at the center of every general framework designed to drive the next generations (OECD, 2013), and asking for a complete revision of the traditional ways to examine performance (Stiglitz *et al.*, 2009).

Over the last few years, wellbeing has seen almost exponential growth in terms of relevance and attention. Since 2010, the most discussed research topics have converged towards cognitive, decision-making, and managerial issues (Cucino *et al.*, 2021). The literature on the subject is florid and extensive, and various studies can be found published in journals in the most varied fields and disciplines, applying different methodologies and points of view.

Wellbeing has attracted even more attention in the recent past, thanks to climate change and the Covid-19 pandemic. There is a need to question how companies can meet the ever-changing needs of consumers. In a globalized and highly competitive market, where supply far exceeds demand, it is essential to be able to survive, anticipate customer needs, and fully satisfy them in all their nuances. In this sense, customer engagement is no longer just a fundamental goal to be achieved, but a necessary condition for the survival of a business (Hollebeek and Belk, 2021). Customer engagement is not simply measured as a minimum level to be achieved, but it is a real experience to be enjoyed by the possible consumer to the fullest and to be implemented and improved more and more. The shopping experience to be provided must continuously evolve and must be expanded based on individual preferences and customer wants and needs. According to Lemon and Verhoef (2016), the customer decision journey is characterized by three main phases, which are represented by the moment before the purchase, the moment itself, and the following one. Therefore, the efforts that businesses make to make customers happy with their experience must be extended to all three phases of the process, through as many points of contact as possible. This indicates how, nowadays, how customers' needs and desires are met and satisfied is almost as important as the product offered. The customer decision journey, as a journey of the consumer who meets the business, will ensure that at the end of the three phases highlighted, a positive or negative opinion is generated. This subjective evaluation depends on one's adventure with the brand and will affect the customer experience. In this sense, customer experiences will strongly depend on the client's experience during the customer decision journey. Consumer wellbeing, likewise, will be strongly influenced by the evaluation of the brand, the shopping journey, and the experience. For this reason, businesses will have to aim, through their products and services, to achieve a higher level of wellbeing from customers. Such a priority emerges among young generations. The recent survey conducted on Millennials (Deloitte, 2021) shows that future wellbeing frightens new generations. According to the survey run on Millennials (those born between 1981 and 1995), three main concerns scare them: health, unemployment, and climate change (in all cases more than 25% of the sample). Further, younger consumers - that is Generation Z (those born between 1996 and 2005) - perceive results with higher urgency for the environmental issue. Sustainability is a top priority that fundamentally affects individual lifestyles, consumption choices, and wellbeing.

Indeed, the history of wellbeing literature has always been articulated and rich, but it has become even more complex recently when sustainability entered the field: the emerging environmental issues strongly influence individual well-being (Simmonds and Gazley, 2021). The concept of sustainability, in its social, environmental, and economic dimensions, represents a central topic for many, including policymakers, organizations, and individuals, and it has generated significant attention from the academic world in numerous disciplines, especially naturalistic and social ones

(Bhaskar *et al.*, 2010). The desire to influence behaviors already widely adopted and harmful to the environment and the intention to prevent them in the future lie at the basis of sustainability (Hofkirchner, 2017). Specifically, Ostrom *et al.* (2015) proposes that sustainability and wellbeing are connected by way of transformative services. The latter aims at creating better conditions for individuals, ecosystems in general, and their wellbeing. In this context, wellbeing is understood in a broad sense and considers both objective aspects and subjective aspects, bearing in mind hedonistic aspects (Anderson *et al.*, 2013; Black and Gallan, 2015). Such a complex and articulated construct have numerous applications in the most diverse fields, from psychology to marketing and from medicine to management. The multidisciplinary nature of wellbeing represents at the same time a strength and a weakness when one wants to study it in depth. Despite a high level of relevance and attention, the evolution of this stream of research is still largely unknown. This paper aims at filling this gap, by analyzing the past, current, and future relationship of wellbeing with sustainability in marketing studies. Specifically, we address two research questions, as follows:

RQ1: What main dimensions of wellbeing have been explored by the scientific literature with a focus on economics and management disciplines?

RQ2: What are/should be the directions for future wellbeing marketing research?

To answer these questions, a Bibliometric Analysis is carried out on the marketing scientific international literature, searching for correlations between wellbeing and sustainability. Our analysis is based on a systematic review of 500 articles that have been analyzed in detail.

This paper is articulated into five sections. Section 1 presents the analysis of the existing marketing literature related to wellbeing. Section 2 describes the details of the bibliometric analysis that has been performed, the strategies used, and the key findings. Section 3 is devoted to discussing the results and Section 4 presents the main implications and the emerging future trends expected in this field.

1. Wellbeing in marketing studies

Wellbeing is one of the most discussed topics in ancient and modern studies; by the middle of the seventeenth century, wellbeing has become a cornerstone across several fields. Despite such a long history, the study of wellbeing in economics and management is quite innovative. In the '70s its study has been especially devoted to three themes, closely interconnected: (a) its relationships with happiness; (b) the development of innovative measurement scales for its assessment; and (c) the relationships between its subjective and objective dimensions. Clarifying the construct and defining it precisely is not easy (Myers and Diener, 1995).

At that time, wellbeing and happiness has been treated as unique constructs. One of the most important studies is that by Bradburn (1969), who defines happiness as a set of individual positive affect and sets wellbeing as the difference between positive and negative emotional states at a given time. Wellbeing is a broader concept than happiness, being the latter only part of it (Ryff, 1989; Ryff and Keyes, 1995; Waterman, 1993). Indeed, wellbeing can be defined as the “good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences” (OECD, 2013: 10). Happiness instead is currently regarded as an experience of fulfillment, i.e., a state of contentment, related to the positive area of affect (Lyubomirsky, 2001).

Apart from the definition, the seminal work by Bradburn (1969) proposes another contribution that generated much debate: the link between the two dimensions (i.e. positive and negative effects). Understanding whether the two dimensions are independent or somewhat correlated has been a hot topic in that period (Brenner, 1975; Kozma and Stones, 1980). Towards that end, more empirical studies based on innovative scales of measurement flourished (Bryant and Veroff, 1982; Hardings, 1982; Zevon and Tellegen, 1982). Still today many scholars focus their studies on the analysis of the existing relationship between the positive and negative effects of Diener & Emmons (in press, 1984).

Over time, the scientific communities, mainly in the fields of sociology and psychology, have started to highlight that happiness is only a part of a broader construct, i.e., wellbeing. The latter refers to the subjective assessment of one's own life and situations and is, therefore, more comprehensive than happiness, which refers instead to the positive emotions that individuals might experience at a certain point in time. Wellbeing is not only emotional; it is cognitive as well (OECD, 2013). Such a feature is nowadays considered the basis of the nature of wellbeing, as a composite of objective and subjective factors. Starting from Campbell (1976), two dimensions of wellbeing emerged, one related to the more subjective assessment of one's life and the second one more related to quantitative and objective variables. In sum, everyone evaluates their life conditions differently (Andrews and Withey, 1976; Tatarkiewicz, 1976). Wellbeing derives from subjective and objective determinants, which contribute toward creating individual quality of life, life evaluations, hedonic experiences, and priorities (Stiglitz *et al.*, 2009). Objective factors include income, good health, supportive marriage, good social relationships, freedom, democracy, lack of tragedy, and so forth (Argyle, 1999; Diener and Lucas, 1999; Frey and Stutzer, 2002; Gerdtham and Johannesson, 2001). Although wellbeing concerns "a large collection of happy moments" (Chekola, 1975) most psychologists note that objective factors account only for 15% of the variance of happiness and life satisfaction, thus indicating the need to look for other possible subjective factors (Andrews and Withey, 1976; Argyle, 1999; Diener, 1984; Diener *et al.*, 1999) expected to remain relevant in promoting subjective wellbeing (Diener & Seligman, 2004). The evaluation of the objective factors is typically related to a benchmark such as other members of the community (Buss, 2000; Carp and Carp, 1982; Emmons *et al.*, 1983; Van Praag *et al.*, 2003), and it gradually adapts to the changing situations (Brickman and Campbell, 1971). Further, the relationships between objective factors such as income and happiness might not be linear (Deaton, 2008). Indeed, "psychological variables that help in dealing with these life events may be able to explain such a psychological phenomenon better than the objective determinants" (Mohanty, 2014: 82). Several economists have also started to explore subjective wellbeing (Frank, 1997, 2005; Layard, 2005), investigating it as a broader feeling of self-satisfaction than what is implied by the narrow textbook definition of "utility." Over time subjective wellbeing has evolved and is strongly correlated with some quantifiable variables. Diener (1984) identifies six variables that influence individual subjective wellbeing:

- 1) Personal satisfaction. It is also understood as self-esteem. It represents the dimension with the highest observed correlation factor (0.55) with aspects that belong to daily life;
- 2) Income. It is a subjective perception that strongly depends on the conditions of the specific country;
- 3) Demographic variables. Variables such as age, gender, religion, etc. could influence the way individuals are looking at life and the opportunity they might have based on these aspects;
- 4) Behaviors and habits. They represent the public sphere and the aspect related to the sociality of individuals, it includes friends and the social community in which they live;
- 5) Personality. Everyone responds differently to external stimuli and this difference in internalizing events, either if they are positive or negative, depends on the individual personality.
- 6) Biological influences. They refer to non-optimal health conditions, even mental health, negatively affecting the wellbeing of individuals.

Such an evolution has gone hand in hand with a revision and advancement of the measurement scales (Brenner, 1975). The multidimensional nature of wellbeing does not allow its assessment by way of a single indicator, but it asks for a combination of different and interacting variables. Towards that end, the starting point is the wellbeing definition. It encompasses three main aspects (Dolan and White, 2007; Sen *et al.*, 2009; OECD, 2013):

- Satisfaction with Life. This component reflects the cognitive assessment of a person's life or specific more focused aspects of it, e.g., job, finance, house, health, leisure, and environment. Thus, life evaluation results from the cognitive evaluation of personal life, which is typically captured in memories (Kahneman *et al.*, 1999).

- **Affect.** This component captures a person's feelings or emotional states at a given point in time (Diener, 1984; Kahneman *et al.*, 1999). Thus, different from life evaluation, affect refers to the experienced emotions at specific points of time not to memories later on. Further, being that emotions are a complex construct, affect is articulated in two main dimensions: positive emotions and negative emotions. The former comprises happiness, joy, and contentment; the latter include sadness, anger, fear, and anxiety.
- **Eudaimonia.** The last component reflects the individual sense of purpose and meaning in life, gathering the extent to which individuals realize their potential (Huppert and So, 2009; Michaelson *et al.*, 2009; Clark and Senik, 2011; Deci and Ryan, 2006). Thus, this component is related to individual abilities and the way they function in generating the desired outcomes. In that regard, this component comprehends autonomy, competence, interest in learning, goal orientation, sense of purpose, resilience, social engagement, caring, and altruism.

Those components relate to several ways of measuring wellbeing. They vary in many respects, but they all share the fact that these measures use self-reported scales, and they all represent, to a large extent, the characteristics they are designed to measure (Diener, 1984). More recently, a key contribution is the one known as the PERMA model: Seligman (2011) proposes a model made by five wellbeing dimensions, namely Positive emotions, Engagement, Relationships, Meaning, and Accomplishments (Butler and Kern, 2016). This model is expected to be largely employed in marketing (Hollebeek and Belk, 2021).

Wellbeing involves numerous factors, and it is impossible to fully analyze it without taking into consideration the environmental issue and the implications it has and can have on individuals. More than twenty-five years ago, Dodds (1997) proposed sustainability as a collective need, with strong and long-term direct and indirect impacts on individuals' life. The more immediate direct effects concern the health conditions of human beings, while the indirect refers to mood, guilt, and concern for the future. Dodds' theory is based on the criticism of the traditional economy for neglecting its context defined as "wider social and biophysical systems." Therefore, wellbeing can be generated only by analyzing it in a broader, more complex, and three-dimensional framework. According to the author, the most encouraging approaches to the study of wellbeing are precisely those that identify and respond to universal human needs. Towards that end, he proposes four categories of theoretical approaches to wellbeing depending on their point of view, proposing wellbeing as:

1. "a state of mind." It arises from Bentham's theory and proposes that wellbeing consists of a favorable state of mind, a sort of intrinsic serenity. Michalos (1980, 1985) defines psychological wellbeing as a function of gaps related to the perception of seven dimensions (namely, aspirations, social comparison, personal history, disappointment, hope, fairness, and needs). These variables change from person to person, some are more profound and subjective, while others arise from comparison with others or with self-imposed standards, very similar to what was seen previously with the comparison theory;
2. "a state of the world." It is based on the measurement of objective variables, such as health, quality of life, and it uses more stringent numerical indicators (for example weight, and blood-work analysis as a measurement of health).
3. "a human capacity." This theory is linked to the social justice discourse. Individuals are satisfied because they live in an environment that adopts correct, transparent, and fair institutions and processes. Wellbeing strongly depends on external and not alterable conditions.
4. "a necessary condition." The last category of wellbeing is based on satisfying people's needs, which can be explicit or hidden. In this framework, the author inserts sustainability as a necessary condition for the satisfaction of human needs.

The theme of wellbeing is receiving increasing attention and its relevance is twofold. Firstly, considering the ever-increasing importance of the topic and the numerous research fields it involves, it is highly relevant from an academic point of view. Secondly, it can be said that it also holds importance in the contextual dimension, considering the growing interest in satisfying consumer needs. From the point of view that the purpose of every human action is guided by the achievement of a higher level of wellbeing, there is also the need to consider consumption decisions

as oriented in the same direction. In this framework, a more than satisfactory customer experience is transformed, for the customer, into real subjective wellbeing, giving a perception of serenity to the consumer who uses that specific good or service.

Since the increase in customer wellbeing is mandatory for marketing, we aim to better understand its construct by way of a bibliometric approach.

2. Bibliometric Analysis

Studies on sustainability, climate change, and the impact they have on individuals are relatively recent thus boosting the attention of the scientific community. The same path can be found with the construct of wellbeing, as a widely studied subject, but not analyzed entirely in its multidisciplinary. Indeed, wellbeing and the specific focus on the concept of sustainability represent an evergreen and constantly evolving topic. Recently there has been an increase in the interest of scholars in trying to better understand these topics and the interplay between those variables. The scientific literature in the last decade presents an almost exponential increase of articles concerning these concepts; especially after the COVID-19 pandemic wellbeing has been more investigated.

To investigate the trend, a preliminary analysis has been conducted on a total sample of 535 articles identified by way of the following criteria: (a) wellbeing and sustainability as keywords, (b) 1993-2022 as the investigated period, (c) “Business” and “Management” as the kind of investigated scientific journals, and (d) the Web of Science as the publisher-independent global citation database. Figure 1 shows an emerging increase in attention starting in 2019.

Fig. 1: Number of articles published from 1993 to 2022 on Wellbeing and Sustainability topics in the “Business” and “Management” categories



These results show how wellbeing and sustainability have experienced a moment of growing importance in the most varied fields and disciplines. The relationship between the two topics is largely reflected in numerous aspects of the daily life of individuals. Thus, it is not surprising that in the last decade, scholars have tried to analyze wellbeing, sustainability, and their reciprocal link in depth. Over the years, different approaches have been used, an evolution of these themes has emerged, and several topics, categories, points of view, and methods of analysis have been investigated. They all define a large scope of the domain, asking for a bibliometric analysis (Donthu *et al.*, 2021).

2.1. Methodology

A bibliometric analysis (BA) has been run to address the research questions presented above. This methodology uses a systematic and objective analysis of the literature, highlighting the main authors, the themes, and the underlying relationships (Ferreira, 2018).

The bibliometric approach involves a statistical analysis of scientific articles related to certain topics. The output of such analysis also helps to identify future research trends in a specific research field.

2.2. Data Collection

To collect data we used “Web of Science” an online indexing platform that allows access to databases of multidisciplinary scientific publications. WoS is a database that includes publications from all the known sciences. This service uses six online databases that offer access to 18,200 scientific journals in various subjects, 60.000 books, and 160.000 conference titles. Furthermore, the Web of Science collects literature starting from the year 1900, thus guaranteeing the analysis of the evolution of scientific production over time. In addition, it provides data from scholarly publications complete with citations.

Any query runs on Web of Science (WoS) allows the selection of several options. In this research the following search terms have been selected to set the scope of our study (Donthu *et al.*, 2021):

- Keywords: “Wellbeing” and “Sustainability” have been used as keywords,
- Years of publication: no specific criteria have been used;
- Categories of documents: only articles published in English have been selected to limit the analysis to the internationally relevant unit of analysis;
- Research areas: “Management” and “Business” have been selected as research areas.

The final sample of the investigated publications includes a total of 500 scientific articles.

2.3. Data Analysis

Our dataset has been analyzed by way of Bibliometrix, a package widely and openly available on R. It allows the study of the selected publications by employing graphic maps and tables and carrying out analyses of various authors, citations, sources, keywords, and kinds of documents (Aria and Cuccurullo, 2017; Cucino *et al.*, 2021).

3. Findings

3.1 Descriptive analysis

A total sample of 500 documents has been analyzed, articulated as follows: 441 scientific articles, 17 book chapters, 35 Early Access, and 7 Proceedings papers. Table 1 presents the main characteristics of the analyzed documents by way of the user-friendly R interface, which are the description of the sample, the document contents, the authors’ collaboration, and the document types.

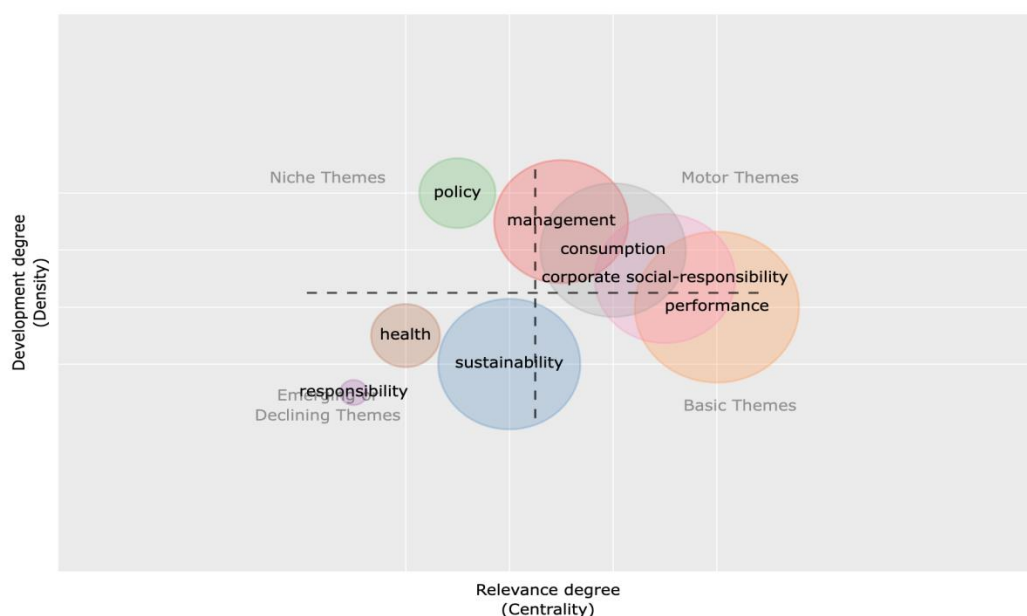
Tab. 1. Key features of the investigated documents

Description	Results
Documents	500
Sources (Journals, Books, etc)	235
Period	1993-2022
References	29017
Average years from publication	5.45
Average citations per documents	20.24
Average citations per year per doc	3.067
Document contents	
Keywords Plus (ID)	1131
Author's Keywords (DE)	1881
AUTHORS	
Authors	1405
Author Appearances	1467
Authors of single-authored documents	74
Authors of multi-authored documents	1331
Authors' collaboration	
Single-authored documents	77
Documents per Author	0.356
Authors per Document	2.81
Co-Authors per Documents	2.93
Collaboration Index	3.15
Document types	
Article	441
Book Chapter	17
Early Access	35
Proceedings Paper	7

3.1. Thematic Analysis

We employed the keywords of each of the 500 documents included in our sample as a way to analyze the emerging topics and to understand their evolution over time. To carry out this procedure we used two main units of measurement for each topic that has been analyzed: (a) its network centrality as a measure of relevance, and (b) its density (i.e. the number of publications) as an assessment of the level of its development. The two dimensions describe a spatial science map, on which the topics are positioned. Figure 2 presents our science map.

Fig. 2: Thematic map

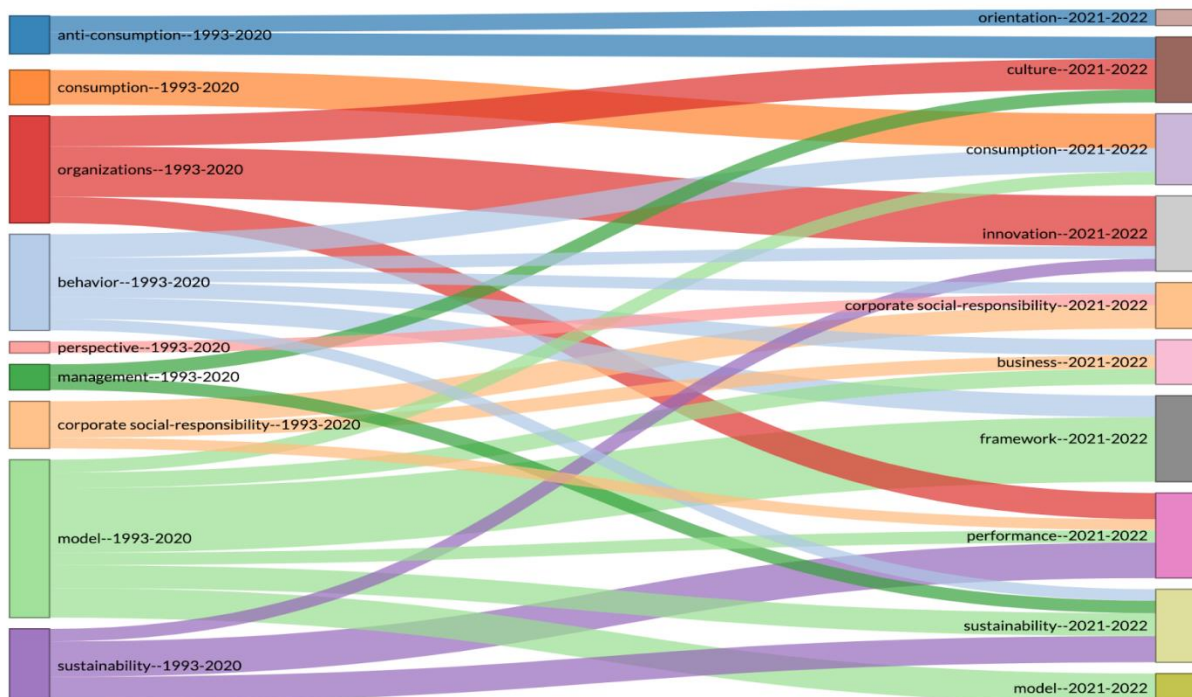


The horizontal axis measures the relevance degree - centrality - while the y-axis measures the level of development or density of the topic. The topics are then located in four quadrants according to the combined degree of centrality and density. This positioning map provides important insights to understand popularity, emergency, and in general the evolution of the constructs.

At the top right of the figure, the more niche themes are highlighted, therefore more focused on a very specific and narrow dimension. On the top left instead the driving themes, therefore those that push and carry forward research, among these we can find management, consumption, and corporate social responsibility, thus showing how such topics are relevant in the analyzed articles focused on wellbeing and sustainability. At the bottom right, on the other hand, there are the basic themes. It is interesting to note how the dial is rather bare and empty, precisely because with the passage of time and publications, topics of this type consolidate and are considered as “motor themes”. The basic themes are such in an initial phase, and over time are showing an increasing interest gathered from the scientific community. Therefore, topics in this area can be seen as the most promising ones. Finally, at the bottom left the emerging themes are located. They represent extremely recent aspects. In this category, there are topics such as sustainability (in the corporate sense), health, and responsibility (both as corporate social responsibility and as individual concepts).

Thus, the thematic analysis provides us with a first grasp of the evolution of the studies. Topics related to sustainability and wellbeing in management studies are driven by different components, and the evolution of wellbeing from consumption to CSR highlights how measurement has gradually emerged as a central topic deserving of scholars’ attention. Such analysis allows for a closer analysis of the evolution of this stream of research. Indeed, it shows not only that a turning point in its popularity is set approximately in 2019-2020, years closely related to the Covid pandemic, but it also shows an increasing level of specialization. Indeed, over the years, the emerging components of wellbeing have evolved towards higher levels of specialization. Figure 3 presents the thematic evolution of the various emerging concepts by using 2020 as the cutting edge. The figure adopts the most relevant data visualization theory recommendation and proposes “the thematic arrangement of knowledge in the field/domain” (Pereira and Bamel, 2022, p. 7). Thus, it provides important inputs for a better understanding of the possible future evolution of the research stream.

Fig. 3: Thematic evolution from 1993 to 2022 (the cutting year 2020)



More in detail, Figure 3 shows the evolution and the contexts through which studies on sustainability and wellbeing have been developed. The idea behind this representation is to see how certain thematic areas evolve and change over time. Thus, a representation of the situation before and after the moment of cutting and division into two phases is obtained. It shows on the left the main thematic areas that have had an important impact on the scientific literature from 1993 to 2020, and on the right, there are those belonging to the years 2021 and 2022. The analysis is carried out on the main keywords proposed in the published documents. Altogether, the findings represent the evolution of these concepts over time. A closer look at each of them is needed.

Let's take "sustainability". The term has been studied from 1993 to 2020, but in the last two years, it has been used in more than one context, thus broadening both its meaning and domain. Indeed, since 2020 this topic has remained partly true to itself, but has also crossed its thematic boundaries and has entered and evolved into topics related to "innovation" and "performance".

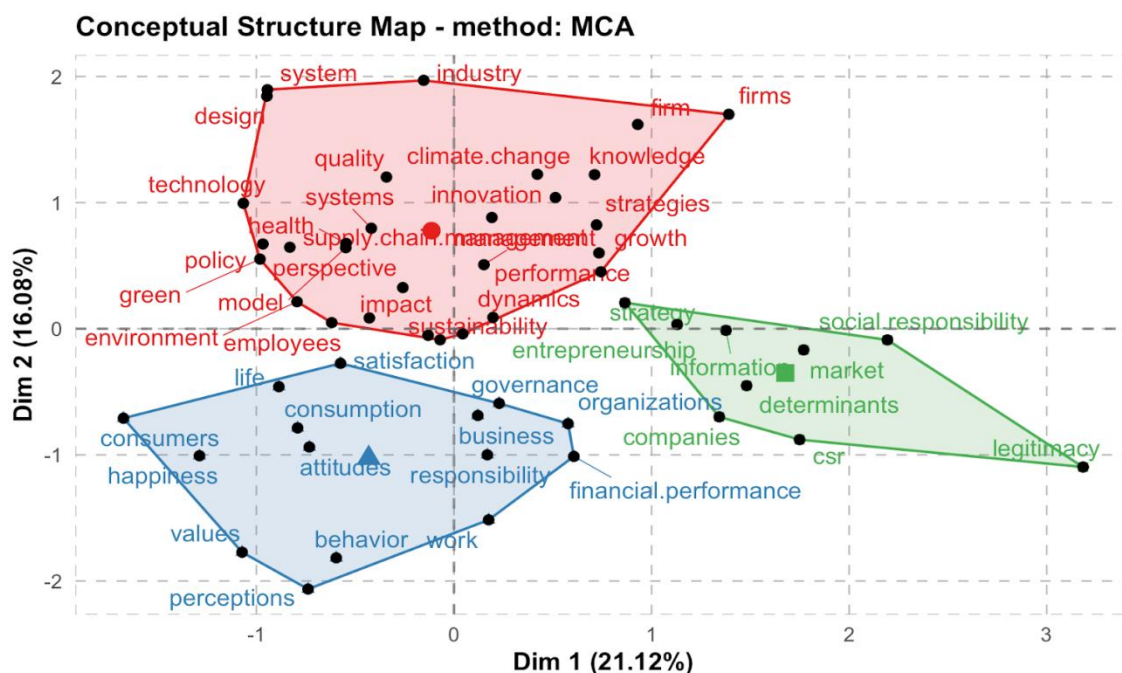
The analysis of the case of "behavior" is even more evident. Over time, it has been divided into six other topics, including "corporate social responsibility" and "sustainability". Therefore, a higher level of specialization in more micro-topics and more application contexts emerges, thus making the study of this concept more precise and schematic. On the other hand, the analysis of organizations is divided into three main blocks. They all focus on the study of the same effects, but they emphasize different points of view, such as culture, innovation, and corporate performance.

The thematic evolution of the topics therefore clearly shows increasing evolution and specialization of the literature on wellbeing and sustainability

3.2. Bibliographic coupling analysis

Wellbeing, undoubtedly, has received in the recent past growing attention both from academics and practitioners fuelling a new cultural change. The growing interest in wellbeing is paired with topics like climate change. To better analyze such a correlation we carried out an analysis aimed at exploring how literature has treated this duo. Specifically, we have run a Factorial Analysis on the main keywords of the documents, using the Multiple Correspondence Analysis method. Findings show three main clusters corresponding to three macro-areas of study. As shown in Figure 4, three main clusters emerge from the analysis of the 500 documents of our sample: namely, organizational, consumer, and ethical approaches.

Fig. 4. Main Clusters



The cluster “organizational approach” (Cluster 1, in red in Figure 4) includes documents that focus on the analysis of issues related to wellbeing and sustainability, maintaining a corporate and managerial approach. This group of keywords highlights a line of academic research that deeply studies how to apply more sustainable strategies to the corporate world. Innovation and technology play a fundamental role in this cluster, precisely because in some cases the implementation of sustainable strategies and performance measurement is still a novelty for companies. Moreover, the analysis of performances and KPIs connected to sustainable development is considered relevant by the academic community. Green policies are new and yet not fully explored concepts and that is why it is interesting to better learn how to measure these policies’ impact, specifically regarding the sustainability concept in terms of its social, environmental, and economic dimensions. Within the group, 29 main keywords are identified. This first cluster brings together concepts and problems related to the environmental issue, also in macroeconomic terms, and seen through a strategic and managerial point of view. The document that has contributed most to the composition of the cluster is a paper by Murray, Skene, and Haynes (2017) which extensively explores the concept of circular economy and its most diverse applications. It begins with the analysis of this topic starting from its antecedents in ecology and economics, to then identify main contributions and limitations, including the underestimation of the importance of the social dimension in sustainable processes. Taking into consideration the ethical aspects related to production and supply chain management, the authors have thus formulated a new definition for the concept of the circular economy that affects processes and outputs and that maximizes the health of the ecosystem and individual wellbeing. Sustainable production processes tend to influence consumer wellbeing.

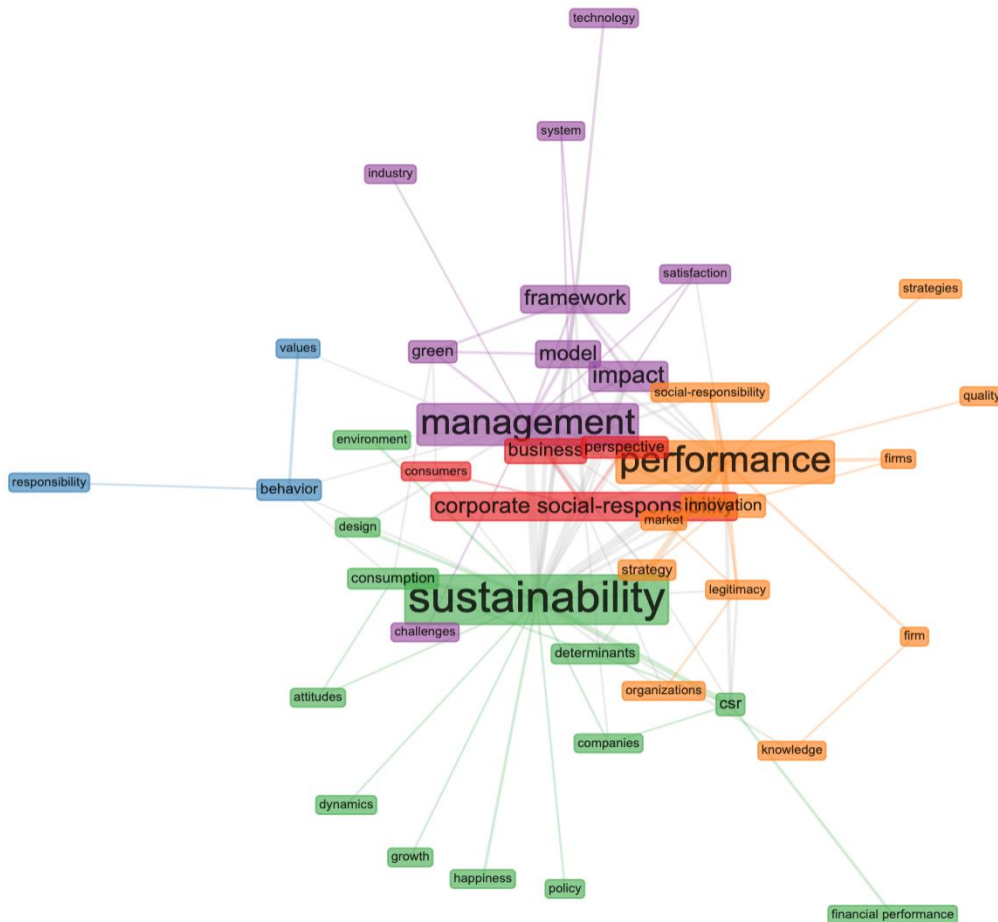
The second macro-area emerging from our analysis is called the “consumer approach” (cluster 2, in blue in Figure 4). This cluster is more focused on issues related to consumers, such as their lifestyles, perceptions, emotions, and purchasing behaviors. The total number of identified main keywords is 15. The most relevant publication in the identification of the cluster focuses on the study of the impact that the spiritual quotient, a construct that connects the emotional quotient with the intellectual one, has on organizational sustainability (Akhtar *et al.*, 2017). This aspect, therefore, links the purely managerial dimension with the personal and emotional dimension of individuals, touching on topics such as happiness, responsibility, and consumer values. The blue cluster represents a stream of research focusing on aspects of purchasing behavior and consumer emotions. It is really important to consider consumers’ points of view while they are experiencing their customer decision journey’s phases and the way in which their wellbeing level is influenced by the business’ sustainable strategies.

The last cluster, called the “ethical approach”, is characterized by the green color in Figure 4. It presents a total of 9 keywords that share a managerial and organizational perspective with a focus on the environmental issue, specifically on the ethical aspect. They all propose corporate social responsibility as an opportunity to do business effectively and efficiently. Generally speaking, in the third cluster, the concept of sustainability falls in the macro aspect of corporate social responsibility. Responsibility toward others and the communities to which one belongs acts as a driving force for the implementation of more ethical and socially attentive strategies from businesses and politics. The most weighted article in this cluster was written by Castka and Corbett (2016) and explores the reactions that individuals present in correspondence with exposure to eco-labels. This study suggests that individuals are looking for certainty and reassurance from experts or third parties when they intend to proceed with the purchase of products labeled as sustainable. This resistance to trusting brands that claim to sell sustainable products also depends on the widespread phenomenon of greenwashing, which therefore affects consumers and makes them more likely to suspect the veracity of the information they read; the authors clarify the need to reassure their customers by providing greater guarantees on the correctness and truthfulness of the pieces of information they provide.

3.3. Co-occurrence Network

Finally, the co-occurrence analysis has been employed to locate similar documents based on a frequency count (Small, 1973; Hsiao and Yang, 2011; Culnan, 1986). This study helps us to better understand the most widespread lines of research, how they relate to each other, and possible future developments. Figure 5 highlights 42 main nodes, each of them corresponding to a keyword used several times in the 500 analyzed documents.

Fig. 5: Co-occurrence Network



This analysis is based on the co-occurrence of keywords within the papers, meaning that papers with similar keywords will also have similar disciplinary fields. Five main research streams are formed. This finding shows that there are five research streams focused on wellbeing and sustainability but they adopt different approaches. Three of them are connected by numerous nodes, therefore central for the analytical phase.

The green one is made up of the largest number of terms; its main focus concerns the aspect of sustainability linked to corporate growth, also intended in macroeconomic terms. Indeed, it concerns the policies that should be applied by managers and policymakers to increase the level of individual wellbeing. This group of keywords is similar to the first cluster highlighted in Figure 4, but it enriches it by focusing on the relationship between sustainable strategies and financial performance. The group of keywords that have been highlighted in orange concerns the strategies to achieve excellent performance, with a focus on corporate social responsibility themes. The purple group refers to studies concerning technology and industrial innovation from a managerial point of view. The fourth set (the red one) focuses on the impact that green policies have on consumers and the business image. Therefore, this group relates to consumer wellbeing. The fifth and last group (the blue one) is the least densely populated. Indeed, it puts together only 3 identified keywords. It

analyzes wellbeing and sustainability from the point of view of corporate values. These studies address the managerial commitment toward the new environmental challenges. The generation of value for consumers and the entire society is therefore a key element here.

4. Discussions e conclusions

Our research shows how wellbeing and sustainability studies have evolved over time starting from simple constructs and evolving into multidimensional ones. The bibliometric analysis highlights three key possible perspectives when studying wellbeing and sustainability.

The first perspective refers to the circular economy and its interaction with productive processes (Murray *et al.*, 2017). In this area of inquiry, there is a focus on the analysis of feasible strategies to be able to increase consumer wellbeing with appropriate and sustainable production techniques. It is a line of studies that focuses its attention on the corporate dimension and on sustainable production and management techniques, which can therefore improve the performance of the business itself and increase the level of consumer wellbeing.

The second macro area focuses more on the emotional dimension of consumers, thus analyzing thoughts and feelings (Akhtar *et al.*, 2017). This emotional element together with the personal values and expectations of the individual will influence their behavior and choices, both in life and in consumption. The emotional sphere of consumers is fundamental for businesses that will have to try to convince possible customers that their products are suitable for their needs and wants, and that, at the same time, with sustainable strategies, they can increase their individual wellbeing level, by respecting the planet and reflecting their values and beliefs. From this point of view, the sustainable dimension must become part of the corporate culture, and not be considered just an extra that companies may, or may not, meet.

The third perspective focuses on sustainability, but it adopts a broader sense than merely the pure environmental dimension. In particular, it deals with corporate social responsibility as a range of many sustainable aspects with special attention to the ethical dimension. The articles included in this last stream of research consider sustainability as a broad spectrum of concepts. They are not limited to the study of sustainable strategies, but they have a focus on the selection of what is ethical and what is not. Sustainability is fully part of responsible decision-making choices, according to corporate social responsibility. This field of research is also interested in analyzing and applying to the business world strategies that reflect the social and economic dimensions, not only the environmental ones.

The managerial studies on wellbeing and sustainability especially concern the implementation of effective and efficient business strategies. On the contrary, those more related to psychological disciplines and marketing put the consumers at the center of their attention, including their consumption experiences as a driver of consumer wellbeing.

The second research question addresses the future evolution of this stream of research, trying to analyze the directions for these research trends. To answer this question, the keywords analysis of the documents belonging to our sample and their thematic evolution is mandatory. Towards that end, the co-occurrence network allows for the identification of the main keywords and their clustering. This analysis, combined with the study of the evolution of the topics, provides a clear vision of the research trends in recent years regarding wellbeing and sustainability.

It is interesting to analyze the evolution that the research fields have undergone; in particular, recently, there has been a growing interest in specific dimensions. Compared to older documents in the Web of Science sample, modern ones present more wellbeing measurement options. The need to quantify, assess, and measure wellbeing has recently emerged as crucial for individuals, companies, and policymakers. In fact, recently there has been a shift in research boundaries: what was once a part of the analysis of the model of the business has turned into a more precise study of company performance. This direction, undertaken by various disciplines in their scientific research, was soon transformed into the desire of companies to use more precise and punctual measurement tools to

better understand the relationship between consumer wellbeing and sustainability. That's the direction that the scientific community is undertaking. In the next future, these research areas on measurement scales will be studied with growing focus and will be put into practice by companies, in order to improve their competitive performance. Similarly, our study also shows that the term innovation appears as a keyword in several recent documents. The analysis of consumer behavior has spread particularly from the disciplines concerning the business organization and sustainability. Innovation is, therefore, the driving force that leads toward this turning point; wellbeing and sustainability appear as fundamental values for firms. Such a high level of attention by managers stimulates scholars to pay greater attention. Further, the high rate of technological innovation is likely to stimulate this area of inquiry even more. It is also interesting to examine the increasingly important role that culture has for organizations. Indeed, compared to the initial step of these studies, there has been a considerable increase in the use of this term as a keyword in documents. The reason lies above all in the change in the market conditions in which businesses operate. If some time ago the demand exceeded or equaled the supply, in recent years this has not been the case anymore, but there has been a dramatic change of course. This meant that organizations, in order to survive, had to be chosen by consumers among all those competitors offering similar products and services. They struggle in the competitive battle, more than in the past. Towards that end, a high level of brand differentiation cannot be postponed, along with a customer-centric approach. The organizational aspects of cultural centrality are crucial with culture being a top priority for competitive companies. Scholars have to study such demanding and challenging areas, whose investments are typically risky and long-term. The scientific community, especially in restless periods like the ones we are experiencing, has started to take these elements into consideration and analyze them on a continuous base to fully understand the conditions in which one has to operate. A final research direction that has emerged for the near future lies in brand communication strategies. Indeed, this is one of the major concerns highlighted by consumers is the greenwashing phenomenon. Individuals, given the tendency to falsely sponsor sustainable products, as some businesses do, have developed a reluctance to buy and trust the pieces of information they get from points of contact controlled by the specific brand. In this sense, the literature will have to evolve to try to understand how to reassure consumers and how to be able to regain their lost trust.

As with any other study, also our findings are affected by limitations. Specifically, although intended, our scope is limited to managerial and business studies. Since wellbeing and sustainability are multidisciplinary, any limit in the scope might lead to partial results. Second, our findings emerge from a sample of 500 documents, while it might be possible that an extension of the analysis over time might lead to new results. Thus, future studies should extend the scope of our analysis.

The path toward wellbeing and sustainability might be numerous, but the goal is set for the future of our society and our scientific community.

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Reaching the SDGs by 2030: At what point is Italy? Evidence from firms at the regional clusters' level

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Abstract

Framing of the research. *The SDGs implementation, one of the more urgent and current challenges, requires the adaptation to sub-national contexts and the involvement of many actors including the firms.*

Purpose of the paper. *The paper examines the Italian situation as to the achievement of the SDGs through the lens of the adoption of the 2030 Agenda by the firms from different Italian regions.*

Methodology. *The research involved a sample of 30 Italian listed companies from Northern and Central-Southern Italy, selected by the CONSOB's list of firms providing a non-financial declaration. An integral reading of the documents with subsequent interpretation were performed.*

Results. *Regional localization does not affect the overall contribution to the SDGs being limited for all firms. Instead, the geographic localization of firms at regional scale differentiates the prioritized SDGs: Northern firms are more oriented to social and economic SDGs, while Central-Southern firms to environmental ones.*

Research limitations. *The paper represents a preliminary exploration of the Italian firms' advancements towards the SDGs over a regional space. Future research developments could be addressed to the sample enlargement and the focus on sub-national specificities of other countries around the world.*

Managerial implications. *Italian firms should enhance their commitment to the 2030 Agenda in all its ambitions, incorporating the sustainable goals within the corporate culture and strategic posture.*

Originality of the paper. *The study responds to the need of considering the sub-national specificities in the literature on sustainable development by capturing the connections between firms, belonging territory, and SDGs.*

Key words: *2030 Agenda for Sustainable Development; Sustainable development goals; SDG contribution; geographical localization; regional clusters; Italy*

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1. Introduction

Biodiversity loss, climate change and widening inequalities are considered ‘wicked problems’ (Waddock and McIntosh, 2011) which need to be urgently addressed to shift the world on to a sustainable and resilient path. In 2015, the United Nations (UN) made a global call for protecting the planetary and human future by publishing the 17 Sustainable Development Goals (SDGs) to achieve by 2030. Their accomplishment has become a global priority because more than one-third of the 2015-2030 period has passed, and the already slow advancements towards the goals have been further held back by the Covid-19 outbreak (UN, 2021). As a result, the need for accelerating on the path to goal achievement is evident in civil society, policymakers, and scholars (Pastore and Ugolini, 2020).

In this context, the emphasis in the implementation of the SDGs varies by geographic area and this requires further analysis of local contexts to develop a comparative analysis that delineates the progress towards sustainable development over space (Salvia *et al.*, 2019; Liu, 2021). The SDGs must take into account regional- and country-level starting points: goals and targets, conceived for all nations, must be adapted to sub-national realities because there is a great deal of variation between and within countries (Nicolai *et al.*, 2015) and diversities among different sub-national areas are a prerequisite of sustainability at the national level (Clarke and Lawn, 2008; Pulselli *et al.*, 2012).

Comparative studies looking at differences among countries in SDGs achievement starts to appear in academia (i.e., Garcia *et al.*, 2017; Reverte, 2022; Kuc-Czarnecka *et al.*, 2023); however, comparisons at regional level are still limited (D’Adamo *et al.*, 2021). This represents an important gap because regions, intended as the spatial scale below a state, is the most appropriate scale for studying sustainability: in fact, environmental functioning and human activities interact most intensely at this scale and their balance is crucial to study and address sustainability issues (Coelho *et al.*, 2006; Salimzadeh *et al.*, 2013). Furthermore, the necessity of considering the sub-national specificities, giving attention to the territory, is even more important for Italy, a country historically characterized by strong regional specificities and differences, which find their radicalization in the so-called North-South gap (Alaimo and Maggino, 2020).

On these bases, this paper aims to examine the Italian situation as to the achievement of the SDGs to highlight potential territorial differences or homogeneity through the lens of the adoption of the 2030 Agenda by the firms from different Italian regions. This firms’ perspective is chosen due to the acknowledgment that the sustainable development agenda cannot be achieved without business (UN, 2015). Thus, all firms - regardless of their country, size, and industry - are called to give an important contribution in the SDGs era. Thus, the following research question (RQ) arises: *Does geographic localization of firms at regional scale differentiate the contribution of Italian firms to the SDGs?*

With this in mind, we conducted an empirical research based on secondary data, by answering to the call of some scholars (van der Waal *et al.*, 2021; Mio *et al.*, 2020) who have invited the academia to empirically study the firms’ contribution to the SDGs. Most studies are conceptual and interpretative; thus, they underline fundamental aspects of the topic, but without delineating the trends at scale (Calabrese *et al.*, 2022). The research involved a sample of 30 Italian listed companies from different regions, selected by the Italian National Commission for Stock-Exchange Market (CONSOB)’s list of firms providing a non-financial declaration (NFD).

The findings reveal that the geographic localization does not differentiate the overall SDGs contribution of Italian firms, that show a low effort regardless of regional macro-area of belonging. Conversely, the geographic localization affects which SDGs are prioritized by sample firms.

This paper provides some theoretical and practical contributions. First, we try to fill the need of considering the sub-national specificities in literature on sustainable development (Salvia *et al.*, 2019; Liu, 2021) by capturing the connections between firms, belonging territory, and SDGs. To maintain the comparability of the results, the analysis is based on global data available in the public domain. Second, the multiple dimensionalities of the SDGs are taken into account without

computing indices or averages that impose autonomous weights. Third, the results of the analysis are interesting for policy makers and government authorities to regulate the pursuit of sustainability goals and should put in place appropriate regional-level targets, along with flexible implementation plans.

The remainder of this study is organized as follows. After a literature review on 2030 Agenda and factors influencing the firms' contributions to SDGs (Section 2), the method is explained (Section 3), followed by the description and discussion of the findings (Sections 4 and 5). Finally, this study proposes theoretical and managerial implications, and concludes with limitations and possible directions for future research (Section 6).

2. Theoretical background

2.1 2030 Agenda for Sustainable Development

In the UN resolution “Transforming our world: the 2030 Agenda for Sustainable Development” (UN, 2015), the adherent states established 17 goals (Fig. 1), 169 related targets, and more than 230 indicators as a guideline, covering nearly all fields of life, to globally undertake a balance between achievement of economic progress, protection of the environment, and safeguard of social interests (Price Waterhouse Coopers *et al.*, 2018; Mio *et al.*, 2020; Martinoli, 2021). Since then, the contemporary sustainability literature has centred on the UN's various SDGs embedding the three pillars of sustainability (i.e., economic, social, and environmental) (Capobianco *et al.*, 2022).

In the light of a more ambitious vision of transformative change towards reaching a more sustainable future by the year 2030, the SDGs represent an evolution of their predecessors such as the Millennium Development Goals (MDGs), whose deadline was reached in 2015. In particular, MDGs aimed at eradicating misery and creating better health conditions within developing countries that are extremely dependent on funding from richer countries (Van Zanten and Van Tulder, 2018). Instead, SDGs guide in a balanced way the economic growth, social development, and environmental sustainability globally within both developed and developing countries (Pizzi *et al.*, 2021). Moreover, the SDGs' focus is not only on international cooperation, but also on sustainable development within the countries through a joint effort by governments, civil society, and public and private organizations (Kumar *et al.*, 2016). Finally, the SDGs pay more attention to issues of environmental sustainability than was expressed by the MDGs (Griggs *et al.*, 2013).

In sum, the distinguishing features of 2030 Agenda are the principles of universality and indivisibility: universality implies that the SDGs apply to all nations and actors around the globe, regardless of current level of income or sustainability challenges; instead, indivisibility means that the implementation of the SDGs should be based on integrated approaches rather than on siloed knowledge and policy-making (Bennich *et al.*, 2020).

Fig. 1: United Nations Sustainable Development Goals



Source: UN website

In terms of SDGs formulation, the goals are herein described in brief (UN, 2016) by highlighting the multidimensionality of sustainability challenges. To begin, SDG 1 - *No poverty* emphasizes on reducing poverty by half the world people through nationally appropriate social protection systems to create the basis for an integrated and inclusive economic development. SDG 2 - *Zero hunger* aims at ensuring safe, nutritious, and abundant food to people, also promoting a sustainable agriculture, while SDG 3 - *Good health and wellbeing* refers to reduction of the global maternal and children mortality caused by infectious and chronic diseases. SDG 4 - *Quality education* is focused on filling the education gap between males and females by providing them with completely free, equitable and quality opportunities to gain pre-school, primary and secondary education. However, education at all levels remains a key focus of this goal because it acts as a catalyst in strengthening the capacity building (Leal Filho *et al.*, 2019). SDG 5 - *Gender Equality* is related to the elimination of all forms of violence against women and girls in the public and private spheres, and pink endorsement in decision-making and leadership roles. SDG 6 - *Clean water and sanitation* touches on the access to clean drinking water and hygiene facilities, while SDG 7 - *Affordable and clean energy* emphasizes on access to affordable, reliable, sustainable energy for all by implicating an energy infrastructure expansion which leads to an increased economic activities and employment opportunities. SDG 8 - *Decent work and economic growth* aims at providing labor standards in line with human dignity, equal employment opportunities for all, also eradicating unemployment and child labor. SGD 9 - *Industry, innovation, and infrastructure* emphasizes an inclusive and sustainable industrialization by leveraging on technology, innovation and sustainable infrastructure, while SGD 10 - *Reduced inequalities* is related to the development of the conditions of countries being at the bottom of the pyramid, also helping them to fight the internal economic, social and political challenges. SGD 11 - *Sustainable cities and communities* is focused on the improvement of living standard of the general population by ensuring good quality and safe housing access, sustainable transportation, and availability of support services, while SDG 12 - *Responsible consumption and production* touches on the encouragement of both manufacturers and consumers to show responsibility towards the consumption of resources. SDG 13 - *Climate action* stresses on combating climate change and its impact, while SDG 14 - *Life under water* aims to conserve and ensure the sustainable use of the ocean, seas, and marine resources. Preservation of biodiversity along with ecosystems is the priority of SDG 15 - *Life on land*. Finally, SDG 16 - *Peace, justice, and strong institutions* refers to the promotion of peaceful and inclusive societies with equal access to knowledge and justice services while SDG 17 - Partnership for goals pushes for more collective efforts towards the adoption of all the other SDGs.

2.2. Factors influencing the firms' contributions to SDGs: The geographic area

The governments of the UN member states are not the only actors involved in realizing the SDGs: in fact, the sustainable development agenda cannot be achieved without businesses that are considered as sustainable development agents (Mio *et al.*, 2020). Thus, all firms of any country, size, and industry are called to give an important contribution in the SDGs era by appealing for their creativity and innovation to generate value for the common good (UN, 2015). Previous literature has already recognized the key role of businesses in achieving the sustainable development (Wicki and Hansen, 2019; Garcia-Sanchez *et al.*, 2020; Cerquetti and Montella, 2021) but there is still just scant evidence on the factors influencing the firms' contributions to SDGs since corporate engagement in the 2030 Agenda is a novel phenomenon (Van der Waal and Thijssens, 2020; Calabrese *et al.*, 2022).

However, pioneering studies have identified firm's size as a key antecedent of corporate contribution to sustainable goals. In this regard, companies of greater size are characterized by a higher likelihood of SDG involvement because they are more visible and subject to greater stakeholder attention than smaller companies (Khaled *et al.*, 2021). Moreover, Mattera and Ruiz-Morales (2021) state that small-medium enterprises contribute to the SDGs less than multinationals

that have a higher global presence, also in developing countries where the SDGs are particularly relevant (Van der Waal and Thijssens, 2020).

Firm industry represents another factor associated with SDG involvement: in fact, it seems that the firms belonging to industrial sectors more likely to cause social and/or environmental damage (i.e., so-called sensitive sectors) significantly contribute to the SDGs (Cosma *et al.*, 2020; Emma and Jennifer, 2021). In addition, Tsalis *et al.* (2020) suggest that firms in the metal product, energy, and telecommunication sectors perform better in terms of the SDGs' adoption, while firms in the real estate industry show a low level of commitment toward the 2030 Agenda (Ionaşcu *et al.*, 2020).

Likewise, the geographic area in which businesses are located also affects the SDG involvement. The firms in developed countries contribute to the SDGs more than those in developing and underdeveloped countries due not only to the different availability of resources for devoting to such goals (Rosati and Faria, 2019; Biglari *et al.*, 2022) but also the disparities in the countries' institutional settings (van der Waal and Thijssens, 2020). These institutional differences are related to country-specific legal origin (civil vs. common law), investors protection rights (strong vs. weak), national culture (ESG-averse vs. ESG-seeking), and corruption level (low vs. high) characterizing the institutional surroundings under which firms are embedded (DasGupta and Roy, 2023). Thus, political instability, corruption, and labour conditions lead the emerging market firms to face greater risks in pursuing sustainable goals than developed market firms (Clark *et al.*, 2015).

The heterogeneous contribution to the SDGs by firms from different countries of origin is recently under investigation (i.e., Garcia *et al.*, 2017; Reverte, 2022; Kuc-Czarnecka *et al.*, 2023), while there is paucity of research on the potential differences in the ESGs adoption by firms across regions of a same country. In particular, prior studies examine regional performance in terms of progress towards the SDGs - some of them are referred to Italian regions (Alaimo and Maggino, 2019; D'Adamo *et al.*, 2021; Cavalli *et al.*, 2021). The premise is that the process of defining policies and actions aimed at achieving the 2030 Agenda requires taking into account the territory. It is the result of the interaction of the same subsystems (environmental, economic and social) of sustainable development: the territory is a geophysical space, corresponding to a specific socio-cultural identity, in which certain economic and social relations occur and develop (Alaimo and Maggino, 2019). Anyway, to the best of our knowledge, regional comparisons based on local firms' contribution to the SDGs are lacking. On the contrary, the key roles of firms should not be neglected in the transformation toward sustainability at regional scale: in fact, the firms are local actors having first-hand knowledge about both context-specific problems and challenges and thereby are able to easily adapt the SDG goals and targets to local conditions (Ansell *et al.*, 2022). Thus, scholars have recently called for further regional comparisons in this research area (D'Adamo *et al.*, 2021) and the present study moves in this direction.

3. Method

3.1 Study setting and sample selection

This study considered Italy as an appropriate research setting because the need for considering the sub-national specificities, focusing on the territory, is highly important for such country. Since the beginning of the 20th century, in fact, Italy is characterized by marked regional specificities and differences on which the so-called North-South gap is built (Alaimo and Maggino, 2020). The strong differences in the territorial development of Italy (i.e., in terms of lower percapita GDP, unemployment rate, child mortality rate, rate of waste recycling, etc.) represent a “*prototypical case of seemingly intractable within-country disparities*” (Bigoni *et al.*, 2019, p. 1).

Originally, the overall sample included 211 Italian companies with ordinary shares listed on the Italian Stock Exchange and included in the Consob's list identifying the firms which issued a NFD in 2022. According to the Directive 2014/95/EU, NFD discloses to firm stakeholders the main corporate non-financial information to communicate the development, performance, position and

impact of firm activity, in terms of environmental, social and employee matters, respect for human rights, anti-corruption and bribery matters (Mazzotta *et al.*, 2020). The choice of this sample is due to the following two reasons: firstly, the consideration that the above-mentioned EU Directive have given impetus to the reporting of not only non-financial information, but also, presumably, issues related to the SDGs; secondly, the availability of public data contained in the NFDs which are published on corporate websites of sample firms.

A heterogeneous geographic distribution of the firms suggested grouping in the regional macro-area according to where the headquarter is established, such as North of Italy (Piedmont, Valle D'Aosta, Lombardy, Liguria, Trentino Alto Adige, Veneto, Friuli Venezia Giulia, Emilia Romagna), and Central-South of Italy (Tuscany, Umbria, Marche, Lazio, Campania, Abruzzo, Molise, Puglia, Basilicata, Calabria, Sicily, Sardinia) (Gazzola *et al.*, 2020). The resulting final sample is composed of the first 30 companies by following this approach: 5 firms in Lombardy, 5 in Veneto, and 5 in Emilia Romagna that represent the new industrial triangle of the Northern Italy (Fortis, 2023); 5 firms in Lazio, 5 in Tuscany, and 5 in Campania, Sicily, and Puglia where there is the highest number of active businesses in Central-South area (source: www.infocamere.it) (Tab. 1).

Tab. 1: The final sample

North of Italy	Lombardy	A2A Spa
		Amplifon Spa
		WeBuild Spa
		Brembo Spa
		Recordati Industria Chimica e Farmaceutica Spa
	Veneto	Safilo Group Spa
		De' Longhi Spa
		AcqueVenete Spa
		Zignano Vetro Spa
		Dovalue Spa
	Emilia Romagna	Aeroporto Bologna Spa
		Hera Spa
		Interpump Group Spa
		Aimag Spa
		Bper Banca Spa
Central-South of Italy	Lazio	Leonardo Spa
		Terna Spa
		Enel Spa
		Eni Spa
		Atlantia Spa
	Tuscany	Piaggio & C. Spa
		Salvatore Ferragamo Spa
		Kedrion Spa
		Eukedos Spa
		Estra Spa
	Campania, Sicily, and Puglia	La Doria Spa
		Seri Industrial Spa
		Mediocredito Centrale- Banca del Mezzogiorno Spa
		Banca di Credito Popolare Scpa
		Banca Agricola Popolare di Ragusa Scpa

Source: our elaboration

The cut-off of 5 firms is due to the few sample companies located in Southern regions that are less industrialized than Northern ones. Such cut-off has been adopted for all macro-areas to make the sample as uniform as possible, hence reducing possible biases associated with underrepresentation of Southern firms and overrepresentation of those located in Northern Italy.

3.2 Data collection

In December 2022, data were collected from secondary sources, such as non-financial information in an individual NFD (or a consolidated NFD in the case of a group) available on corporate websites of sample firms. The main benefits of collecting secondary data are the timesaving and the opportunity for a large amount of data that could not have been collected on its own (Johnston, 2017). The reports have been selected by keeping in mind three inclusion criteria, such as public access, release in 2021, and verify of a third-party organization that ensures the disclosure of more reliable information (Diaz-Sarachaga, 2021). In doing so, high-quality input data, in terms of relevance and homogeneity, is obtained. The application of these criteria to the entire dataset has resulted in 30 NFDs as usable documents.

To analyze the secondary data, a content analysis was run because it allows eliciting SDG-related information from various sources, critically evaluating them, and understanding the firms' impact on the 2030 Agenda (Calabrese *et al.*, 2021; Silva, 2021; Gunawan *et al.*, 2020). Content analysis was performed manually in accordance with existing literature (Cosma *et al.*, 2020; Silva *et al.*, 2021) for the following two reasons: firstly, much SDGs information were associated to the use of icons for 17 goals that cannot always be processed by content analysis software (i.e., Wordstat 7, Nvivo, TLab); secondly, the qualitative information to be interpreted was highly heterogeneous and thereby was not always present in the standard sections of the analyzed reports. Instead, an integral reading of the documents with subsequent interpretation of the contents were performed.

3.3 Data analysis

We have read the 30 reports in full and have assessed the firms' contributions to the SDGs on a 0-4 scale which provides a more granular picture than a Boolean scale. According to Calabrese *et al.* (2022), the five different levels of contributions are: i) 0 if there is not contribution to any SDGs; ii) 1 if SDGs are mentioned as broad statements but without a plan to take action; iii) 2 if SDGs are mentioned and there is a narrative wording about plans to address them; iv) 3 if SDGs are mentioned but firms do not provide their progress towards the stated SDGs; v) 4 if SDGs are mentioned with quantitative achievements. Any disagreements on the assigned score were discussed and resolved by the authors.

To facilitate data analysis, the 17 SDGs were clustered into three groups in accordance with existing literature (Szennay *et al.*, 2019; Kumar *et al.*, 2018) and resembling the three pillars of sustainability. Thus, we shaped the economic group with the SDGs 8, 9, 11, 12 and 17, the social group including the SDGs 1-5, 10, and 16, and the environmental group with the SDGs 6, 7, 13-15. Subsequently, the overall score for the 17 SDGs and scores of economic, social, and environmental SDGs were converted to an ordinal scale measuring low, medium, and high impact (Calabrese *et al.*, 2022). The ordinal scale was thus developed: the scores of each group of SDGs (economic, social, environmental, and overall SDGs) were added up by producing one score for each report. Such scores were then partitioned into three intervals, such as low (the interval with the lowest scores), high (the interval with the highest scores), and medium (the other interval). The aggregated scores for each group of SDGs in each report obtained the label of the interval they have fallen into.

After the above-mentioned steps, data were analyzed through two contingency tables - one for Northern firms and the other for Central-South firms of Italy - in which cells contained the number of reports with a specific score (high, medium, low) for each SDG groups (economic, social, environmental, and overall SDGs). The two crosstabs are analyzed separately to establish if the variables (i.e., impacts and SDG groups) of each are independent, that is if no relationship exists between them, in the sense that the distribution of a variable does not influence the distribution of the other and viceversa (Montera, 2017).

4. Results

A descriptive analysis of the sample reveals that many Northern firms operate in manufacturing industries (53.3%) by providing industrial products (such as cables, pumps, brakes, etc.) mainly to business-to-business markets. Instead, more than half of the Central-Southern firms operate in service industries (67%) related to energy and financials by serving both business-to-business and business-to-client markets. In terms of firm size, the sample includes large firms whose employees exceed the 250 units (European Commission, 2003).

Table 2 shows the total number of Northern firms for each SDG group along with the corresponding percentage in parentheses. To illustrate, the farther left cells indicate that Northern firms disclose a low contribution (46.6%) to overall SDGs; despite this, a focus on social (60%) and economic (53.3%) SDGs emerges. The Pearson's Chi-square statistics has a value of 23.258 (df = 4), which means that the test is significant (p-value <0.01). Thus, Table's 2 distribution is not random.

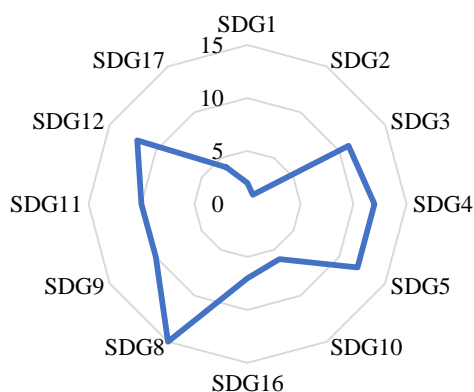
Tab. 2: Chi-square association among impacts and SDGs groups: Northern firms

	Economic SDGs	Social SDGs	Environmental SDGs	Overall SDGs
High	8 (53.3%)	9 (60%)	2 (13.3%)	3 (20%)
Medium	5 (33.3%)	4 (26.6%)	5 (33.3%)	5 (33.3%)
Low	2 (13.3%)	2 (13.3%)	8 (53.3%)	7 (46.6%)
	15	15	15	15

Source: our elaboration

By considering the number of Northern firms that disclosure SDG achievement (Fig. 2), their sustainable effort is addressed mainly to SDG 4 - *Quality education* (80%) and SDG 5 - *Gender equality* (80%) related to social group, and to SDG 8 - *Decent work and economic growth* (100%) and SDG 12 - *Responsible consumption and production* (80%) with reference to economic group.

Fig. 2: Prioritized social and economic SDGs: Northern firms (in number)



Source: our elaboration

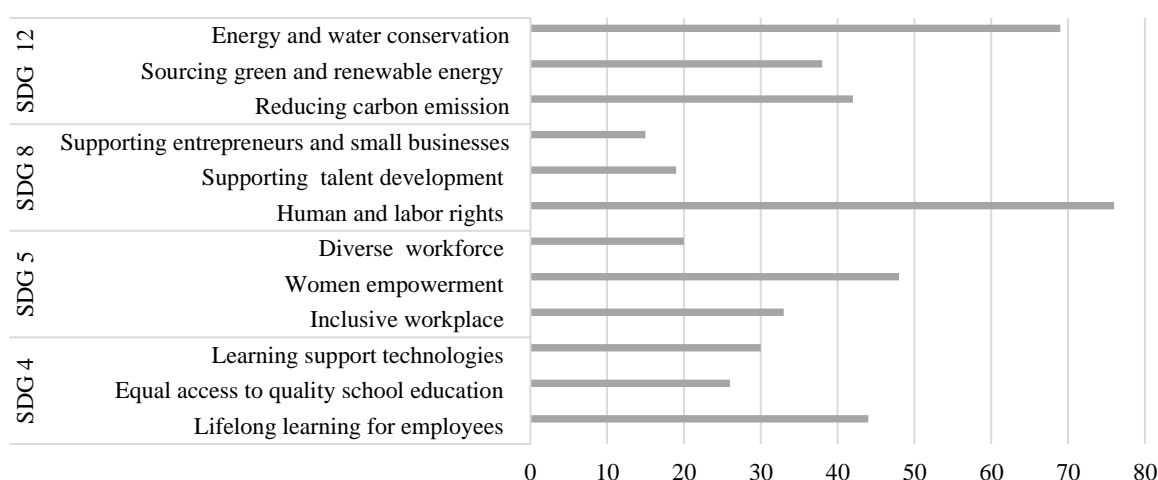
Within these prioritized social SDGs, Figure 3 shows that the most frequent actions related to SDG 4 - *Quality education* consist of promoting lifelong learning opportunities for employees (44%) by providing access to training courses to enhance skills and further professional development in areas such as sustainability, anti-corruption measures, and human rights. For instance, Recordati Spa has implemented a two-year training course for all Group employees to disseminate the Code of Ethics' principles. This course, available in the languages of subsidiaries, was implemented online, also distributing hard-copy formats for employees without access to digital devices. The course, which included a final assessment of learning, was completed by over three thousand employees. Regarding SDG 5 - *Gender equality*, Northern firms engage in female empowerment by fostering women's careers in leadership and management (38%). For instance,

Hera Spa boasts 34% of women appointed managers, middle managers, and managerial employees in 2021.

Within the above-mentioned prioritized economic SDGs, Figure 2 shows that the most frequent actions related to SDG 8 - *Decent work and economic growth* consist of preserving human rights in the workplace (76%) (i.e., improvements of the wages and health and safety conditions, prohibition of the forced labor and child labor, etc.). For instance, A2A Spa has made available to workers Capsule, a health-pod for self-assessment of the physical state, resilience to stress, cellular aging, and food style. More than 2,000 accesses have been registered.

Regarding SDG 12 - *Responsible consumption and production*, Northern firms engage in waste reduction by leveraging on prevention, reduction, and reuse policies (i.e., energy and water conservation) (69%). In Zignago Vetro Spa, for instance, the recycled glass - that has now almost reached 50% of the total glass produced by the Group - and packaging recycling are integral parts of the productive process.

Fig. 3: Social and economic SDGs: main actions by Northern firms (in %)*



*More actions are contextually implemented within SDG 4, 5, and 8; thus, the total of the actions exceeds 100% for those specific SDGs.

Source: our elaboration

Table 3 shows the total number of Central-Southern firms for each SDG group along with the corresponding percentage in parentheses. To illustrate, the farther left cells indicate that Central-Southern firms disclose a low contribution (53.3%) to overall SDGs; despite this, a focus on environmental SDGs (47%) emerges. The Pearson's Chi-square statistics has a value of 19.726 (df = 4), which means that the test is significant (p-value <0.01). Thus, Table's 3 distribution is not random.

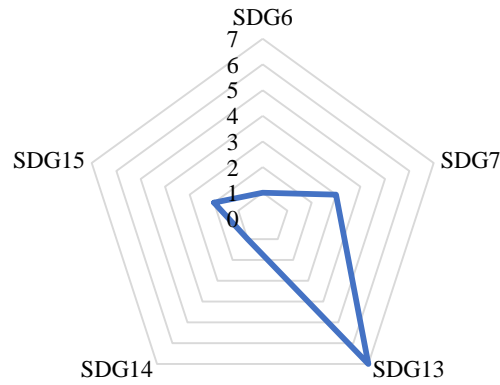
Tab. 3: Chi-square association among the variables: Central-Southern firms

	Economic SDGs	Social SDGs	Environmental SDGs	Overall SDGs
High	2 (13.3%)	2 (13.3%)	7 (47%)	3 (20%)
Medium	4 (27%)	3 (20%)	5 (33.3%)	4 (27%)
Low	9 (60%)	10 (67%)	3 (20%)	8 (53.3%)
	15	15	15	15

Source: our elaboration

By considering the number of Central-Southern firms that disclosure SDG achievement (Fig. 3), their sustainable effort is addressed mainly to SDG 13 - *Climate action* (47%) with reference to environmental group.

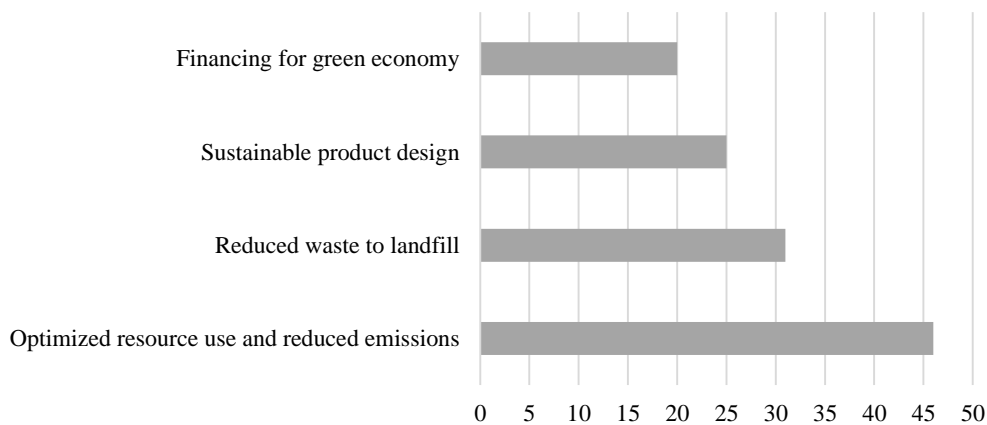
Fig. 3: Prioritized environmental SDGs: Central-Southern firms (in number)



Source: our elaboration

Within these prioritized environmental SDGs, Figure 4 shows that the most frequent actions related to SDG 13 - *Climate action* consist of optimized resource use and reduced emissions (46%) and reduced waste to landfill (31%).

Fig. 4: SDG 13 - Climate action: main actions by Central-Southern firms (in %)*



*More actions are contextually implemented within SDG 13; thus, the total of the actions exceeds 100% for these SDGs.

Source: our elaboration

For instance, La Doria Spa has completed the Crystal Project aimed at reducing packaging surface area and increasing the percentage of material from renewable sources for the juice line Tetra packaging. Thanks to this, there have been reductions in the CO₂ emissions (-14%) and plastic use (-13%). In the same direction, Leonardo Spa has reduced the resources needed for product's prototyping and testing by adopting digital twins. Moreover, the same firm has reduced the waste generated during the production process through additive manufacturing and has extended the product-life thanks to predictive maintenance.

5. Discussion

By moving from our research question, findings demonstrate that the geographic localization of businesses at regional scale acts as not always a critical variable on the 2030 Agenda achievement in Italy. While many differences in SDG approach tend to be highlighted at country level (Rosati and Faria, 2019; van der Waal and Thijssens, 2020; Biglari *et al.*, 2022), this paper suggests less univocal evidence when narrowing the analysis to a within-country scope.

In terms of overall contribution of Italian firms to the SDGs, the localization in Northern or Central-Southern Italy does not exert any impact: in fact, all firms analyzed show an overall SDG involvement being still limited, regardless by their regional macro-area of belonging. In this vein, the classical North-South gap in Italy is reduced because the historic within-country disparities become more nuanced. The limited contribution to the 2030 Agenda by Italian firms is consistent with the critical position of Italy whose results for nine out of seventeen sustainable goals are behind the average values of the EU (Rapporto ASviS, 2022).

The low contribution of Italian firms to the SDGs can be interpreted as evidence that organizations still consider sustainable goals an aspirational or forward-looking agenda rather than an urgent objective (Scott and McGill, 2018). This could be since SDGs are perceived as pertained to a macro level and thereby centered around worldwide challenges of sustainable development, seemingly distant from corporate sustainability that is perceived at the micro level (i.e., business level). This mismatch is reflected by progress in corporate sustainability not always being paired with achievement of the SDGs (Dyllick and Muff, 2015).

Furthermore, our empirical analysis points out that few firms provide their progress towards the stated SDGs and mention the adopted SDGs with quantitative achievements. This evidence implies a symbolic attitude of Italian firms toward disclosure, in line with European and global trends (Manes-Rossi and Nicolò, 2022; Calabrese *et al.*, 2022). The symbolic approach is based on a marketing and impression management rationale (Boiral, 2013) which, induced by the increasing pressures from social parties to incorporate the SDGs in business strategies and operations, is aimed at influencing stakeholder perception of a substantive adoption of the 2030 Agenda. Through a symbolic compliance with sustainable goals, firms can gain, maintain, or repair legitimacy, improve reputation, and access more resources, without making potentially costly substantive changes from business-as-usual (Clementino and Perkins, 2021). In this sense, the risk of SDG-washing and cherry-picking practices looms large (Heras-Saizarbitoria *et al.*, 2021), if firms do not undergo significant transformation to substantially accommodate the 2030 Agenda's ambitions.

The neutrality of the regional localization of companies disappears when shifting the focus from the overall contribution of Italian firms to the sustainable goals to prioritized SDGs for firms settled in the different macro-areas of Italy. Thus, the geographic localization of firms at regional scale differentiates the SDGs considered priorities by Italian firms. Specifically, Northern firms address their efforts towards social and economic SDGs, while Central-Southern firms are more oriented to environmental ones. In this regard, companies are affected by the sustainability policies adopted by the belonging regions. Recent studies, in fact, outline that the Northern regions are more engaged in socio-economic SDGs than other Italian regions, while the Southern regions overperform in environmental SDGs compared to the rest of Italy (ISTAT 2021, D'Adamo *et al.*, 2021). In other words, the pathway toward the SDGs attainment by regions and that undertaken by local firms are aligned, paving the way to a co-created translation of Agenda's global goals into local aspirations (Ansell *et al.*, 2022). Individual changes, in fact, are not enough to concrete the SDGs but there is a necessity for collective changes involving local actors (Caputo *et al.*, 2020).

The finding that the SDGs priorities vary across geographical localization of firms is in line with Gazzola *et al.* (2020) who state that divergences in the industrialization, economic prosperity, societal structures, and cultural values still emerge among the Italian areas and affect companies' approaches to sustainability issues.

Looking at our results at glance, it emerges that businesses from different regional clusters focus on specific goals at the expenses of others within their prioritized SDGs. In particular, Northern firms address their efforts towards SDGs 4 and 5 (social goals) and SDGs 8 and 12 (economic goals), while Central-Southern firms are more oriented to SDG 13 (environmental goals). This aspect could be considered as a form of sustainability metonymy, whereby meeting selected goals are taken to signify conformity to the whole of the 2030 Agenda, disregarding the other ambitions (Siegel and Lima, 2020). On the contrary, the important challenges proposed by the SDGs cannot be dealt with in isolation but should be pursued holistically together to arise the expected benefits

due to the integrated and indivisible nature of the sustainable goals (Mio *et al.*, 2020; Dwivedi *et al.*, 2021).

6. Conclusions

The paper investigates if and how the geographic localization of firms at regional scale differentiates the contribution of Italian firms to the SDGs intended as one of the biggest challenges to be urgently addressed to ensure a future for the planet and humanity. The content analysis of NFDs published by 30 Italian companies, listed on the Italian Stock Exchange and grouped by regional macro-areas, reveals that the geographic localization does not differentiate the overall contribution of Italian firms to the SDGs but affects which SDGs are prioritized by such firms.

From the theoretical viewpoint, this study responds to the call to better understand the role of businesses as sustainable development agents (Mio *et al.*, 2020), especially through regional comparisons lacking in this research area (D'Adamo *et al.*, 2021). Thus, we try to fill the need of considering the sub-national specificities in literature on sustainable development (Salvia *et al.*, 2019; Liu, 2021) by capturing the connections between firms, belonging territory, and SDGs. Moreover, prior studies determining the SDGs' presence or absence (e.g., Rosati and Faria, 2019; Emma and Jennifer, 2021; van der Waal *et al.*, 2021) are extended because a multi-level scale is herein employed to derive how the firms contribute to SDGs. In addition, an initial picture of main actions implemented at a regional scale is also provided, in line with the need for understanding how the companies are working to put the SDGs into action (van der Waal & Thijssens, 2020; Bonfanti *et al.*, 2022).

From the managerial viewpoint, this paper suggests that Italian firms should enhance their commitment to the 2030 Agenda by substantially incorporating the sustainable goals within their corporate culture and strategic behavior. In this direction, a means for undertaking the disruptive transformations required to achieve the SDGs consists of leveraging and redeploying firms' innovation capabilities to develop new offerings, processes, and business models centered on SDGs (Scherer and Voegtlin, 2020; Gutierrez *et al.*, 2022). In addition, local firms should enhance their awareness of owning the so-called NATO¹ resources that promote the achievement of SDGs (Ansell *et al.*, 2022).

From the practical viewpoint, research findings are also interesting for government authorities, especially for regional policy makers, to define well-targeted interventions for resolving regional gaps and fostering the full adoption of the 2030 Agenda by local businesses.

The limitations of this work suggest avenues for further research. Data was collected only from NFDs, but much non-financial information is included in social and environmental reports provided on a voluntary basis. Thus, future research could broaden the data sources to other documents, such as social, sustainability, and integrated reports, also reviewing the abstracts of the strategic plans presented to investors in the road shows and available in the Investor Relation section of the corporate websites. Moreover, the present study chooses a limited sample, but a wider perspective can be adopted by investigating all firms of the Consob's list to find more robust findings. In the future, it would be interesting to monitor the SDGs adoption over time, extending the temporal horizon herein adopted, and to run cross-country studies for comparing the sub-national specificities of Italy in terms of SDGs achievement with those of other countries around the world.

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¹ NATO stands for: a) Nodality: actor's connections to other actors' resources; b) Authority: actor's position and legitimacy; c) Treasure: financial and organizational resources of an actor; and, d) Organizational capacity in terms of problem solving or organizing of fruitful interactions with other actors (Ansell *et al.*, 2022, p. 14).

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Local resources and interactions in an entrepreneurial ecosystem perspective: an introductory study

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Abstract

Framing of the research. *The aim is to highlight the importance of the local roots and resources in an entrepreneurial ecosystem. Due to the repercussions of the post-pandemic situation and the Russia-Ukraine conflict, it became relevant to support and boost new technologies from an efficient and sustainable perspective.*

Purpose of the paper. *It wants to provide the keynotes for a study on the benefits of collaboration between companies and the impact on regional development.*

Methodology. *This conceptual paper uses online data collection to present the 3Sun Gigafactory company. This research provides a theoretical framework to prove the results of technological investments and collaborations in an entrepreneurial ecosystem. The study proposes methods that can be further applied.*

Results. *Providing the following research path, the study proposes some propositions to be tested on job creation, regional development, hence sustainable culture. This analysis delivers the first assumptions on these matters.*

Research limitations. *As an ongoing project, limitations can be found in obtaining archival data on the investments to analyse the financial actions of the company, and updated relevant data to study the development of the factory.*

Managerial implications. *The research is relevant to study the results of the development of a technological cluster and a way of employing local resources and investments. Likewise, it can offer ideas for the spread of new materials and technologies, and for inspiring the collaboration between companies.*

Originality of the paper. *This framework can be applied worldwide and can be interpreted as a contribution to the entrepreneurial ecosystem literature. 3Sun Gigafactory is the biggest solar panel producer in Italy, and, referring to the project, destined to be soon the biggest in Europe.*

Key words: *local roots; entrepreneurial ecosystem; sustainable management; green transition; regional development*

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1. Introduction

Local culture, enriched with its credence and values, is embedded in people's identity: it is reflected in many aspects of life affecting people's behaviour, such as the way of living and interacting with others, along with the way of doing business (Klamer, 1997; Streeten, 2006; Akerlof and Kranton, 2010). Not only is the culture the single element that influences the economy in a specific geographical area, but also all the differences that characterize each site and that can constitute a competitive advantage for other companies. Indeed, local territories can offer cost advantages, skills, and resources that allow multinational companies to invest and implement global sourcing, overtaking the boundaries (Johnson *et al.*, 2017). In the global-local dilemma, condensed in the expression "think global, act local", which suggests adapting global thinking to the local contexts (Kefalas, 1998), sustainable development needs to be evaluated too (Devine-Wright, 2013). Sustainability and environmental management, often considered under the umbrella of corporate social responsibility (CSR), are becoming today more and more relevant in light of the rising awareness of global environmental changes (Johnson, 2015; Hörisch *et al.*, 2015).

Can local roots be a driver for companies' sustainable development goals? In general, partnerships between firms, alliances, and collaboration to leverage resources and capabilities are crucial to grow and enter certain locations with country-specific advantages (Gibbons and Henderson, 2011; Prashantham and Birkinshaw, 2022). Employing new resources produces a competitive advantage for firms, which can create opportunities for new markets or new targets, neutralize threats and avoid the weaknesses of the business (Porter, 1985).

As Barney (1991) stated, firm resources can be classified into three categories, which are physical, human, and organizational. The first ones are given by the physical technology employed in the company, for instance, the firm's plant, equipment, location, and access to raw materials. The second ones consist of training, experience, relationships, and people. The last ones include the formal and informal planning, controlling, and coordinating systems, in addition to the information exchange between groups inside the company and between the company and external subjects (Barney, 1991). It is valuable to notice that the resources can be offered by the land too, in terms of soil, sun, commodities, or raw materials, and be used for product and sustainable development (Allais *et al.*, 2015; Voronkova *et al.*, 2019; Voronkova *et al.*, 2019). This last aspect, especially, is currently spreading among companies, thanks to an increase in awareness on the matter, as well as the growth of European and international regulations on green behaviour. Indeed, the European Commission is currently working on a "Green Deal" which aims to support behaviours, new technologies, materials, and new energy suppliers, to have sustainable management in respect of climate and environment (Fetting, 2020; Siddi, 2020; Szpilko and Ejdyś, 2022; European Commission, 2022).

Without any doubt, implementing a winning strategy with the best partners and resources requires years and years of effort between companies and stakeholders, from the formation of the alliance itself to the continuous evolution in a match with internal and external factors (Gulati, 1998). However, it is noteworthy that also the characteristics of entrepreneurship in a geographical area can make a difference in the evolution of business partnerships. In other words, the existence of business ecosystems can affect the development of company networks, thanks to the availability of certain economic activities, such as the diffusion of technical knowledge and know-how, along with the presence of physical capital resources, human capital resources, and organizational capital resources, as suggested by Moore (1993). According to Nicotra *et al.* (2018), an entrepreneurial ecosystem occurs when innovation and creativity are the reactions to economic and social issues, while Isenberg (2014) defined it as a "dynamic, self-regulating network of many different types of actors". Therefore, from these considerations, it follows that, on the one hand, the entrepreneurial ecosystem can be considered as a driving force and starting point for the development of a network of collaborations and, on the other hand, it can be understood as a consequence of a network of well-established success in a territory.

Nowadays worldwide entrepreneurial ecosystems are coming up beside the most famous ones: next to the most famous Silicon Valley, Austin, the Startup Nation in Israel, we also find other innovation centres in the Netherlands, Finland, Portugal, England, Germany, Estonia and many more countries (Kauffman, 2019; OECD, 2018). It is increasingly common to witness the birth of new clusters of companies that make successful collaborations in an open innovation perspective, progressing in the development of technological knowledge and the employment of resources, also bringing the creation and implementation of components and materials in a perspective of a sustainable economy. Through the example of the company 3Sun Gigafactory, which belongs to an entrepreneurial ecosystem, this research aims to be an introductory study on the world of the entrepreneurial ecosystem.

This paper underlines the importance of resource sharing in the development of the entrepreneurial ecosystem and, in the case of 3Sun Gigafactory, its role in sustainable development. For this reason, the literature review will be based on the theoretical framework of the resources theories and the entrepreneurial ecosystem, focusing attention on the firm. The case of this company will be the keynote to put forward three propositions on the relationship and the impact of this company on the entrepreneurial ecosystem where it is set, and the sustainable development that can promote.

2. Literature review

Grant (1991) defined strategy as “the match an organization makes between its internal resources and skills [...] and the opportunities and risks created by its internal environment”. This means that, even in the same field, each company could be different from the others because of its internal and external factors. In addition to this, organizations can also be inimitable and provided by a certain level of heterogeneity and originality, which may represent the bedrock to achieve a defensive competitive advantage (Johnson *et al.*, 2017). This literature review follows the development path for the companies’ resources and capabilities, analysing the resource-based view, the knowledge-based view, and the entrepreneurial ecosystems.

2.1 Resource-based view

Grant’s resource-based approach to the strategy analysis starts from the assumptions that “resources and capabilities provide the basic direction for a firm’s strategy” and both of them are “the primary source of profit for the firm” (Grant, 1991, p. 116-117). Further, the author proposes a 5-step framework that starts from the identification and classification of the resources to determine strengths and weaknesses for better employment of the resources. These can be thought of as the input of the production process and be classified into six categories: financial, physical, human, technological, reputation, and organizational resources. Following this, it is necessary to define the firm’s capabilities, based on its core competences and those of competitors. Capabilities can also be read as “organizational routines”, which are “regular and predictable patterns of activity which are made up of a sequence of coordinated actions by individuals. A capability is, in essence, a routine, or a number of interacting routines. The organization itself is a huge network of routines. These include the sequence of routines which govern the passage of raw material and components through the production process and top management routines which include routines for monitoring business unit performance, for capital budgeting, and for strategy formulation” (Grant, 1991, p. 122). The third stage for the strategy formulation consists to evaluate the Rent-Earning Potential: it can be intended as the sustainability of competitive advantage (given by the durability, transparency, transferability, and replicability of the resources and capabilities), as well as the ability to have some returns. The above-mentioned properties remind us of and can be added to the ones cited by Barney (1991) in the VRIN model to reach a sustained competitive advantage. Indeed, according to Barney (1991), resources have to be valuable, rare, imperfectly imitable, and (not)

substitutable. Gradually, the attention passes through the resources, the capabilities, and the competitive advantage, up to the fourth part, which would be the very definition of the strategy. This path ends with the identification of the resource gaps and the development of the resource base. This point brings attention back to resources since an organization should fill its lacks, keep up with the competitors and be competitive in the market, requiring the external acquisition of complementary resources (Grant, 1991).

Different scholars have made some criticism of Barney's resource-based view (RBV), among the others Priem and Butler (2001), Armstrong and Shimizu (2007), El Shafeey and Trott (2014), Geraldes R., Lopes da Costa and Geraldes J. (2019). Priem and Buttler are more relevant as they directly address their study "Is the resource-based view a useful perspective for strategic management research?" to Barney, who replied to them with another paper after a few months (Barney, 2001).

To paraphrase the criticism on the resource-based view, it cannot actually be considered as a theory because it contains generalized conditionals ("if/then" statements), it does not include any empirical content, and it does not have a nomic necessity. This latter is the characteristic of theories that require "the occurrence of some phenomenon must be associated with some other phenomenon; the relationship cannot be, simply, by chance" (Hunt, 1991, p. 111). The model seems to give too simplistic definitions to illustrate the resources' properties, as well as the fact that "if product and customer factors vary, then resource values may vary, and unpredictable resource value changes will result in indeterminate outcomes in resource-based analyses" (Priem and Butler, 2001, p. 30). Moreover, these authors demonstrate that RBV cannot be applied in each context and some resources cannot be measured and evaluated, i.e., tacit knowledge, despite their importance as a source of competitive advantage. Furthermore, the RBV approach is defined as static, and, for this reason, it could limit its usefulness for strategy researchers and cannot provide a competitive advantage. The static nature is found for many reasons: "First, the static argument is descriptive: it identifies generic characteristics of rent-generating resources without much attention to differing situations or resource comparisons. [...] Second, the processes through which particular resources provide competitive advantage remain in a black box. [...] Third, some resources studied, such as tacit knowledge, are inherently difficult for practitioners to manipulate. [...] Fourth, in static RBV studies researchers sometimes take a frequently researched strategy subject area, relabel the independent variables as «resources» and the dependent variables as «competitive advantage», and use measures common to much cross-sectional strategy research as operationalizations. [...] Fifth, the static RBV suffers from the problem in that it is quite easy to identify, a posteriori, many «valuable» resources in high-performing firms" (Priem and Butler, 2001, p. 33). The most significant part of the study is at the end since they propose some suggestions to increase RBV credibility and contribution to the strategic research. In brief, the theory should be formalized through clear definitions and concept correlation; it has to reply to how questions (i.e., How can the resource be obtained? How and in which contexts does it contribute to competitive advantage? How does it interact/ compare with other resources?); it has to integrate the temporal component, and, lastly, it has to interact with demand heterogeneity models (Priem and Butler, 2001).

2.2 Knowledge-based view

In the 90's knowledge-based view (KBV) came up beside the RBV, identifying knowledge as the main resource for business development (Nonaka, 1994; Conner and Prahalad, 1996; Grant, 1996; Rullani, 2004). On the one hand, knowledge has many commonalities with the resources and competencies for the achievement of the competitive advantage, it is sometimes limited, expensive to replicate, difficult to transfer, and gives rise to complex problems related to its appropriateness. On the other hand, when the organizational context and network make possible the acquisition and the development of knowledge (both tacit and explicit), the firm has the chance to configure and integrate its internal and external resources for the pursuit of opportunities offered by the surrounding environment. In this way, it becomes possible to strengthen the threshold and

distinctive resources/ capabilities and identify a new source of competitive advantage (Tunisini, Pencarelli, & Ferrucci, 2018). In addition, distinctive capabilities are usually linked to collective learning processes that take place within the company, which require superior coordination of technical-production skills, and the understanding and acquisition of technological trends and customer needs (Prahalad and Hamel, 1990). In Prahalad and Hamel's view (1990, p. 4), distinctive capabilities are the core competences of a company and they are defined as "the collective learning in the organization, especially how to coordinate diverse production skills and integrate multiple streams of technologies." They also add: "At least three tests can be applied to identify core competencies in a company. First, a core competence provides potential access to a wide variety of markets. Competence in display systems, for example, enables a company to participate in such diverse businesses as calculators, miniature TV sets, monitors for laptop computers, and automotive dashboards-which is why Casio's entry into the handheld TV market was predictable. Second, a core competence should make a significant contribution to the perceived customer benefits of the end product. Clearly, Honda's engine expertise fills this bill. Finally, a core competence should be difficult for competitors to imitate. And it will be difficult if it is a complex harmonization of individual technologies and production skills. A rival might acquire some of the technologies that comprise the core competence, but it will find it more difficult to duplicate the more or less comprehensive pattern of internal coordination and learning."

Afterward, the core competences are embodied in the core products, which are the components or subassemblies that actually contribute to the value of the end products. According to Prahalad and Hamer (1990), thinking of a company not as a collection of strategic business units, but as a portfolio of core competencies is the winning strategy for long-life success.

Despite the significance of this framework, scholars made some criticism, focusing attention on the individualism and the opportunism of knowledge in firms (Kogut and Zander, 1992; Hesterly, 2007). In other words, they think that knowledge, considered as information and know-how in firms, is held by individuals and, as a consequence, the change of employees may affect in some way the companies' roots. Additionally, if a firm put some effort to grow and implement its technology, it paradoxically may enhance the chances for imitation. Starting from the point that imitation can be limited by innovation, Kogut and Zander (1992) proposed a "dynamic perspective" which considers that companies acquire new skills by recombining their current capabilities: this would make the processes unique and not easily acquired, plus the growth would be reinforced by the social relationships that currently exist inside the firm itself.

2.3 Entrepreneurial ecosystems

As said before, a strategy aims to give an organization its long-term direction and create value to be competitive in the market. Improving resources and capabilities plays a central role in building sustained competitive advantages; however, companies need to identify growth opportunities too (Johnson *et al.*, 2017). "Strategic entrepreneurship (SE) involves simultaneous opportunity-seeking and advantage-seeking behaviours and results in superior firm performance" (Ireland *et al.*, 2003, p. 963). This quotation shows the bond between two components: strategy and entrepreneurship. The previous has the purpose of creating and supporting competitive advantages; the latter contributes to the identification of new opportunities in the market or environment. The key to strategic entrepreneurship is found in innovation, which is the translation of an idea or technology into a product marketed to consumers, who perceive it as new (Tunisini *et al.*, 2018).

Schumpeter (1934) was the first scholar who looked at the concept of innovation by analysing it as a central activity of entrepreneurial action. In Schumpeter's vision, the entrepreneur is an innovator, the one who, through his own skills, intuition, and creativity, identifies new potential in technologies and translates them into processes and products managed by the company. The author argues that innovation is a process of "creative destruction" because those who innovate make their competitors' offerings obsolete and help move the competition to a more advanced level (Diamond, 2006). This concept is strictly linked to Aulet and Murray's study (2013) that classifies two kinds of

entrepreneurship: innovation-driven enterprises (IDEs) and small and medium enterprises (SMEs). While the latter are often family businesses or businesses with very little external capital, set in local and regional markets only, they typically grow at a linear rate and where innovation is not necessary for establishment and growth, IDEs are completely the opposite. IDEs can have different ownership bases including a wide array of external capital providers, they are focused on global markets and are based on some sort of innovation and potential competitive advantage. Their development requires investments and is not linear, because the company starts by losing money, but if successful, it will have exponential growth (Aulet and Murray, 2013).

The roots of the entrepreneurial ecosystem (EE) can be found in the regional development literature that includes the industrial districts (Marshall, 1920), regional industrial clusters (Porter, 1998), and regional innovation systems (Stam and Spigel, 2017). The analysis made by Stam and Spigel (2017) shows that each approach has a different key outcome (relatively: productivity, employment, productivity of particular industries, innovation) but has in common with the EE the attention for the external environment. On this topic, Nicotra, Romano, Del Giudice, and Schillaci (2018, p. 641), stress that: “In such frameworks, the focus is not specifically on entrepreneurs but on larger system of value creation and innovation and start-ups are considered just a smaller version of larger, international firms. The entrepreneurial approach is different from industrial districts, clusters and innovation systems concepts because it focuses on entrepreneurs and start-ups as unique organizational entities with different capabilities and resources and on the role of social and economic contexts surrounding entrepreneurial processes.”

Literature on EE is quite recent, the majority of scholars have defined it, and pinpointed the main actors and features. Van De Ven (1993) was the first who talked of “an industrial infrastructure that facilitates and constrains entrepreneurship”. The infrastructure involved institutional arrangements to legitimate, regulate, and standardize a new technology, public resource endowments of basic scientific knowledge, financing mechanisms, and a pool of competent labour, as well as proprietary R&D, manufacturing, marketing, and distribution functions. Neck *et al.* (2004) adapted Van de Ven’s work based on a case study in Boulder. According to this study, the entrepreneurial ecosystem is made up of six fundamental components: incubators, spin-offs, informal networks, formal networks, infrastructure, and culture. Each of these components is essential for the creation of new businesses and the development of ecosystems. Isenberg (2011) identifies 50 components divided into six categories: culture, policy, finance, support, human capital, and markets; even if the components can be divided into these categories, there can be hundreds of elements that interact with each other. Spigel (2017) describes three main attributes that affect entrepreneurs. The first is the cultural attribute, which is done by positive attitudes and success stories that can positively influence the entrepreneur. The second is the social attribute, which is made up of networks, capital investment, and talent workers that help entrepreneurs in improving knowledge, performance, and training. The third is the material attribute, which is the university, support services, and open markets that develop new technologies, assist the enterprises, and train the human capital. Nicotra *et al.* (2018) proposed a framework that analyses the causal relation between eco-factors and eco-output, and, in general, explains the functioning of entrepreneurial ecosystem. Eco-factors are the ones of EE that contribute in a certain way to the accumulation of some forms of capital, or rather eco-inputs (financial, knowledge, institutional and social capital, and create eco-output. Eco-outcomes are the outcomes of the productive entrepreneurship (i.e., job creation, new ideas/technologies commercialization, market efficiency); while, eco-impacts refer to the value creation (or growth) of the EC. In other words, the model measures eco-factors with specific indicators, for each of the four forms of capital (eco-input). Later, according to the obtained eco-output, it identifies gross entrepreneurship and productive entrepreneurship, assumption-based and performance-based.

The entrepreneurial ecosystem approach is not free from criticism. For instance, Stam and Spigel (2017) highlight that there is no explanation for the cause-effect relationship between the EE factors and entrepreneurship activity in a territory. In the same way, there is no specification on the geographic reference space of the ecosystem and its evolution. Moreover, as Stam and Spigel

(2017) state, there are not enough answers to the tautological problem: if the EE are systems that produce successful entrepreneurship, does successful entrepreneurship create good EE? Other criticism is related to the lack of theories that can explain how the entrepreneurial ecosystem is created and developed and how the EE are linked between them (Alvedalen and Boschma, 2017), as well as the way in which eco-factors influences productive entrepreneurship (Zucker *et al.*, 1998; Levie and Autio, 2008; Sato *et al.*, 2012).

The aim of this paper is to show that the local roots and the development of the 3Sun Gigafactory can have an impact on different aspects.

3. Methodology

This paper uses online data collection provided by articles, editorials, and company proceedings to present the 3Sun Gigafactory company. This research provides an introductory study to highlight the resonance that a big factory can produce in a territory. It was born from a joint venture between ST-Microelectronics, Sharp, and ENEL, after 13 years, it is today the leading company in the production of solar panels. To reach this result, collaboration with other actors was pivotal, as well as the employment of resources (both financial and human). For its features and partnerships, along with the territory's aspects where it is set, this company is strictly tied to the entrepreneurial ecosystem perspective. Because 3Sun Gigafactory has established itself in the entrepreneurial environment of Catania, Southern Italy, becoming an important reality with great potential, its development, and investments will undoubtedly have effects on the local territory and beyond. For this reason, it could be useful to realize a quantitative study based on company data and regional development to compare the improvement that the company is bringing in three fields: job creation, regional development, and sustainability culture. Since this case can be relevant to increase knowledge of the entrepreneurial ecosystem, it is useful to go in-depth into the proposed case.

Since the 80' the industrial district of Catania, in Sicily, Southern Italy, was known for the large number of high-tech companies set in, first of all, the ST-Microelectronics, a leading company in the field of semiconductor components and their combinations for electronics and electrical engineering. The area also hosted, and still hosts today, other enterprises, such as Antech (satellite telecommunications), SIFI (ophthalmic pharmaceutical products), Elmec (precision mechanics), Teleservice (telecommunications and networking), Tnet (internet provider and IT services), AID (robots and automated systems for agriculture), SAT (semiconductor frame) and many more. The virtuous circle triggered by ST has also attracted investments from other large companies such as Sielte, IBM, and NTET. The success of the area is due to investments, international projects, and the presence of a few subjects: universities, research centres (CNR -Italian National Research Council-, INFN -National Institute of Nuclear Physics-), Consorzio Catania Ricerche (Catania Research Consortium), Science and Technology Park of Sicily, and the IMM, the Institute for Microelectronics and Microsystems. The presence of these advanced training and knowledge production centres in the scientific-technological field makes it possible to generate innovative technical-scientific knowledge and highly qualified and professional human resources. All these factors have contributed to spreading a culture of innovation capable of taking up the challenge of economic and technological development, thus allowing the birth, during the 1990s, of the so-called technological district of the Etna Valley. Today, this technological cluster, thanks to the network of relationships and collaborations, goes beyond the initial spatial boundaries, involving not only the province of Catania but also the neighbouring provinces of Ragusa, Syracuse (south-east district), as well as those of Messina, Enna, and Palermo (Miceli, 2006). At the moment, the industrial district is interested in different investments directed to ST-Microelectronics to improve silicon carbide production (Lecca, 2022; Papa, 2022; Focus Sicilia, 2022)

In August 2010, ST-Microelectronics signed an equally shared joint venture with Enel Green Power and the Japanese company SHARP, to create a solar panel factory in Catania, the 3Sun Gigafactory. The project was financed through self-financing, funding from the CIPE (the Italian

Joint Ministerial Committee for Economic planning) - for 49 million euros - and leading banks. Each partner has underwritten one-third of the equity - with a commitment of 70 million euros in cash or tangible and intangible assets and holds one-third of the shares in the new joint venture (Enel, 2020). Restoring an older industrial facility, in only one year, it became Italy's largest solar panel factory and one of the biggest in Europe (Enel Green Power, 2022).

In December 2011, the company started the production of thin film panels using multi-junction technology, a new generation panel made of amorphous and crystalline silicon, never created before (Ragonesi, 2022; Enel Green Power, 2022). In 2015, the ownership structure changed: Enel Green Power becomes the main and only shareholder of 3Sun Gigafactory, acquiring the shares of Sharp and ST. This piece of news brought also changes in production, indeed, they decide to stop the production of thin-film panels and improve the technology. The production line closed on October 25, 2017: in six years, 3Sun Gigafactory manufactured 6.8 million panels (Percipalle, 2022). Since 2018, it started a new era of production and efficiency. As Sciuto (2022) explains, "in 2018, the market still wasn't ready yet for a solar panel revolution. The mainstream trend was still single-sided modules, while bifacial cells were considered niche products. [...] Bifacial modules are far more sustainable than traditional ones for a variety of reasons. First of all, they're more efficient because they're bifacial, which means they can capture sunlight from their back surface, too: their yield increases to 18%, almost twice as much compared to the 10% yield from thin-film modules. So more clean energy is produced for the same occupied surface – in other words, the cost for the same amount of clean energy produced is lower. Moreover, bifacial panels are stronger and last longer, thirty years or more, which lowers the consumption of raw materials. Finally, the percentage of reclaimable and recyclable materials is higher. But bifacial modules were more than just a goal. Our vision was already set on the next step: heterojunction bifacial modules (HJT), which have the same advantages and even better efficiency. It was a significant step forward, but one we took quickly: we manufactured our first HJT on February 26, 2019, just six months after making the first bifacial panel. As opposed to 2011, when we relied on the experience of the Japanese company Sharp, this time we created the production line entirely on our own."

The last milestone was registered on April 2022, when Enel Green Power signed in Brussels a grant agreement with the European Commission, under the framework of the EU's first Innovation Fund. This project will contribute to the development of TANGO (iTaliAN pv Giga factOry), an industrial-scale production facility for the manufacturing of innovative, sustainable, and high-performance photovoltaic modules at 3Sun (Enel Green Power, 2022). The goal is to increase the production capacity by 15 times (from 200 Megawatt to 3 Gigawatt/year), with an investment of around 600 million euros (of which 118 million by the EU's agreement). Furthermore, it is expected that it will bring a rise in local employment by around 1,000 job positions within 2024, and at the same time boost high-efficiency solar technology in Europe, contributing to the reduction of the continent's energy dependency (Ruberto, 2022; Enel Green Power, 2022; *Il Sole 24 Ore*, 2022).

Analysing the relevant aspects of the 3Sun Gigafactory story, it is worthwhile to highlight the role of the entrepreneurial ecosystem and the impact of this factory on the sustainability field. First of all, focusing the attention on the local roots, it is necessary to say that Sicilian territory and the existence of the Etna Valley pushed in some way the birth of the company. The presence of the existent technological cluster and the characteristics of the territory were decisive for the development of the area and the factory.

3Sun Gigafactory's features reflect the framework of Aulet and Murray's (2013) innovation-driven enterprises. Examining the structure in depth, they have the main traits in common, such as the focus on the global market, and the innovation that drives the competitive advantage. At the beginning of its history, it also had external capital providers and exponential growth, after the total acquisition by Enel Green Power (Enel Green Power, 2022). From an entrepreneurial ecosystem point of view, interpreted as a network of actors, the factory finds its birth from the agreement of different actors (i.e., high-tech companies, energy providers, banks, and investors) and the collaboration between other companies for the panel evolution (Enel, 2020). Technology has been the driver for the 3Sun Gigafactory's success since its beginning: from the thin-film silicon to the

bifacial panels, thanks to an open innovation approach. Yet the bifacial panels were innovative and efficient, as it can be read on Enel Green Power's website (2022), "they captured the light striking the front of the panel as well as the light that reflects off and bounced up from the ground to the back of the panel". The step ahead was in 2020 the production of bifacial heterojunction technology panels, made in collaboration with CEA-INES (the French Institut National de l'Énergie Solaire), with an efficiency level of 24.63%, a world record. The last goal from 2022 is the creation of Tandem cells, made by a perovskite cell as the upper cell and a silicon HJT cell as the lower one. This mix should be extremely performant because it would be able to capture the radiation from both red light (with silicon cells) and blue light (with perovskite cells). This would result in an efficiency boost of over 30%. To make Tandem cells, 3Sun Gigafactory will work with a heterogeneous network of Italian partners, such as ENEA, the CHOSE centre at the Tor Vergata University of Rome, Italian National Research Council's Institute of Structure of Matter (ISM), and BeDimensional, a spin-off company from the Graphene Labs at the Italian Institute of Technology in Genoa (Enel Green Power, 2022).

As regards sustainability, the efforts of the 3Sun Gigafactory are oriented to recycle and reuse raw materials. For instance, silver was reused in the thin-film panel, but they also recover discarded glass, resins, and especially indium from the processing. (Ruberto, 2022). At the same time, the factory pays attention to ensuring the traceability of materials, and, thanks to the use of solar energy, it is involved in important actions to reduce carbon emissions (Enel Green Power, 2022). The EU project Tango is a pilot for improving solar energy use at a global level. Another company interest is also to think of the end of life of the panels, for example producing innovative panels made of plastic and no longer of glass (Cavalcoli, 2022). Ernesto Ciorra, Enel innovability manager, stated "if Silicon Valley is the best place for digital, Etna Valley is becoming the 'Energy Valley', the best place for the world energy revolution" (Ansa, 2022).

To conclude, without any doubt, the company has great potential from an economic and sustainability point of view, which deserves to be investigated in the future. Further studies can be implemented taking into consideration the following propositions.

4. Propositions

First proposition: The EU investments will bring an increase in job positions, in the company and the local area. As the factory is already involved in a growing process with its entrepreneurial network of suppliers and distributors, it will create employment, especially in the Etna Valley. In Meyers's view (2015), the metrics to measure the entrepreneurial ecosystem success are given by sales and jobs. The company will receive funds to grow and increase production; hence, it would be interesting to measure these values in the next future, compared to the present. It would be also interesting to examine how resources affect the strategic investments and the value creation for a company.

Second proposition: Thanks to its commitment and efforts in its growth, the factory will have a positive impact on regional development, especially in terms of partnerships and synergies. Being in the Etna Valley, the firm can expand collaborations with nearby and overseas high-tech companies and attract new investments for the development of new industrial plants. Indeed, scholars such as Kraus *et al.* (2021) sustain that knowledge and innovation are the catalysts for regional development.

Third proposition: Since the interest in improving solar energy technology, the factory will be a boost for the sustainability culture in Sicily and in the whole Europe too. It can be an inspirational model and an incentive to implement sustainable energy management in the local area, but not only. However, Babiak and Trendafilova (2011) find that companies have strategic and legitimacy motives to adopt environmental management practices, while Ervin *et al.* (2013) identify economic purposes, institutional pressures but also management attitudes toward the environment.

Undoubtedly, giving a glance at the goals that 3Sun Gigafactory has set, the company is contributing to upgrade and encourage the development of a solar panel market.

5. Conclusion

This analysis aims to highlight the role of a company's local roots, with the support of the entrepreneurial ecosystem framework. The starting point is the assumption that a company, to be successful in the market, must develop its competitive advantage (Porter, 1985). Many scholars discuss that competitive advantage can be achieved by developing or acquiring resources and capabilities. Since the company's success has to be lasting and strong, these capabilities must be distinctive and dynamic, therefore they should be adapted to the changing and evolving market (Johnson *et al.*, 2017). RBV and KBV have been analysed as an example of theories explaining how firms can achieve competitive advantages. The final part of the literature review was dedicated to the study of the entrepreneurial ecosystem. Then, the paper focused the attention on the case of 3Sun Gigafactory, a company born from a joint venture, today leader in the production of solar panels, now owned by Enel. The example of the factory, set in such a specific territory, can be used as a starting point to develop and support further studies that will take into account the consequences of its presence, regarding 1) Job creation 2) Regional development 3) Sustainability culture. This company was chosen for its local, national, and international relevance, as well as for the impact it can have on the territory and for its commitment to sustainability.

A limitation of the study is that there is not enough literature on entrepreneurial ecosystems and the case of the 3Sun Gigafactory is still in evolution. In the phase of data collection for further studies, it may be difficult to obtain relevant data on the future development of the factory.

However, this analysis can have interesting managerial implications as it is a strong example of how local resources, investments, and entrepreneurial networks create realities with a 360° impact on the environment.

Further research can provide more data in this regard. The development of new materials in Sicily is stimulating, it would be fascinating to trace the impact of the introduction of the new technologies. At the same time, the 3Sun Gigafactory case could be expanded, concerning to its evolution thanks to European funding and technological innovation.

To conclude, the 3Sun Gigafactory with its innovative project will become Europe's largest factory producing high-performance bifacial photovoltaic modules, and, without any doubt, it has already started a new era of energy production.

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Low-cost carriers in the tourism industry: a Big Data perspective on destination management

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Abstract

Framing of the research. *Tourism industry has undergone a profound toward the creation of a very dynamic and complex digital business environment. Novel communication channels, such as Social Media, and the enormous amount of data generated (Big Data), have revolutionised destination management, establishing novel approaches to tourism strategies. Furthermore, the emergence of low-cost carriers has disrupted the market, influencing the mechanisms underlying tourism demand and destination choices.*

Purpose of the paper. *The aim of the paper is to provide an overview of emerging changes in tourism industry as well as to derive propositions to be tested and further expanded in future research.*

Methodology. *We conducted a literature review to provide an overview of the emerging changes in tourism industry and destination management and we derived four propositions to guide future research in the field.*

Results. *We evidence future research directions, suggesting that Social Media empowered by Big Data positively affects local tourism demand as well as the quality of destination experience and that low-cost airlines' decisions influence local demand.*

Research limitations. *Our work is purely theoretical. Future empirical contributions may operationalise the variables to be used for proposition testing.*

Managerial implications. *We suggest that decision makers acting on destination management and low-cost carriers' sides should collaborate to reach efficient strategic behaviours to foster territorial wealth.*

Originality of the paper. *The paper finds a common perspective under which Social Media, Big Data and low-cost carriers can be successfully exploited for more effective destination management decisions.*

Key words: *Social Media, travel industry, tourism demand, destination choices, low-cost airlines, local development.*

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1. Introduction

Tourism industry is a core driver of local development. Attracting touristic flows is therefore strategically relevant and may act as an accelerator of territorial wealth. In this perspective, the destination management organisations (DMO) and transportation infrastructures (such as airports) play a crucial entrepreneurial role: their strategic decisions and actions are able to impact territorial competitiveness and attractiveness. We aim to examine some elements that, if adequately exploited by destination decision-makers, exert an influence on tourists' decisions. Moreover, we explore how local touristic attractiveness may benefit from a strategic collaboration between destination managers and low-cost airline carriers.

Travel and tourism industry has undergone a profound shift as a result of the advent of the Internet, which led to the emergence of the new paradigm of what is called e-tourism. The Internet as primary source of information has indeed fostered the creation of a very dynamic and complex digital ecosystem in which a wide network of tourists interacts with each other to exchange useful information and companies try to connect to tourists and engage with them.

This electronic network is made up of various components as enablers of such interplays among different stakeholders. These components are: social media platforms, travel review websites (such as TripAdvisor), general search engines (such as Google), online travel agencies (OTAs) (such as Booking and Expedia), communication exchange channels (such as YouTube), sites that allow tourists to compare prices (such as Trivago), tour operator websites, blogs and microblogs, and the various major tourism service providers (e.g. airlines, hotels, etc.) (David-Negre *et al.*, 2018). Given the undeniable importance of transportation as an enabler of tourism and given the constant growth of air transportation, a focus on the aviation industry is helpful for a broader understanding of emerging challenges in the tourism industry. The evolution of air market had indeed led to the emergence and empowerment of low-cost carriers, which not only have disrupted the market itself, but they are also impacting the mechanisms underlying tourism demand and destination choices.

The aim of the paper is to provide an overview of three factors that have been disrupting tourism industry in the last decades and to develop propositions on the topics investigated. The remaining of the paper is organised as follows: the first and the second section respectively examine the emergence of Social Media and Big Data as innovations that redefine the paradigm of destination management in influencing tourists' destination decisions as well as their decisions made during the trip. Two propositions are eventually proposed with respect to these two sections. The third and last section explores the effect of the evolved aviation market, characterised by growing market share of low-cost airline companies, on destination decisions, likewise deriving a proposition concerning the section itself and a final proposition that identifies a link between the three sections.

2. Social Media: definition and impact on tourism industry

The focus in this section will concern the components that fall under the umbrella of what are referred to as social media.

The term "Social Media" (SM) was originally used in 1994 on a Tokyo online media environment known as Matisse. The first social media platforms were developed and introduced to the public during that period, which coincided with the early stages of the commercial use of the Internet. Both the variety of social media platforms and the number of people actively using them have expanded dramatically over the course of time, establishing social media as one of the most prominent uses of the Internet (Aichner *et al.*, 2021). Social media, in its broadest sense, refers to the set of web-based apps and interactive platforms that enable users to create, discuss, modify, and share user-generated content (UGCs). Therefore, social media do not just refer to social networking sites like Facebook; they also include blogs (e.g., The Huffington Post), business networks (e.g., LinkedIn), collaborative projects (e.g., Wikipedia), enterprise social networks (e.g., Social Cast), forums, microblogs, photo sharing (e.g., Photobucket), product/services reviews (e.g., Amazon),

social bookmarking (e.g., Pinterest), social gaming (e.g., World of Warcraft), video sharing (e.g., Youtube) and virtual worlds (Aichner and Jacob, 2015) (e.g. Metaverse). The expression SM therefore refers to the various forms of social interactions taking place on a variety of digital media and technologies that enable users to produce and share contents as well as to collaborate with each other. The advent of these new media has revolutionised the way we create information and communicate, but also our consumption habits. The power of social media lies in the fact that they allow people to instantaneously spread knowledge to a potentially worldwide audience, in the form of tweets, posts and other types of web documents, by means of social networking sites and this information are released, received and shared by peers, thus giving rise to innovative ways of collaborating, such as the so-called “collective intelligence”, which refers to the intelligence produced by the interplay of interconnected people who discuss and communicate with each other (Schoder *et al.*, 2013).

A new and extensive global society of always-connected people who are glad to share, interact, and collaborate has been created as a result of the widespread growth of social media sites, which are based on the voluntary public sharing of such information (Miah *et al.*, 2017).

The role played by social media in tourism industry has been widely investigated in tourism literature and, among SM, social networks deserve particular attention due to their growing popularity.

The increasing adoption of social media, especially of social networks, has changed and is still transforming the way tourism companies interact and communicate with tourists and potential tourists. In this evolved environment, traditional communication approaches based on the use of mass media are indeed partially outdated and less effective since tourists have now access to all the information they need on destinations, attractions, and accommodation alternatives through the Internet. Therefore, tourism companies and destination managers need to adopt new channels to reach their potential customers.

The availability of credible information on social media helps travellers develop reasonable expectations and eliminate uncertainty. Because tourism products are intangible, potential tourists require as much information as possible before booking their trip.

They trust other travellers’ recommendations more than official tourist organisations. ~~This form~~ of online interpersonal influence is referred to as electronic Word of Mouth (WoM), which can lead to increased customer satisfaction since it allows to learn what travellers think and feel about their experiences, thus enabling tourism companies to improve their service (for example by finding solutions to issues and questions previously emerged or doubts that tourists have during the travel). WoM allows companies to track their reputation and rivals’ strategies. Since tourists increasingly rely on SM as a source of information, these media have become an increasingly strategic, unbiased, and low-cost way to collect data on tourists (see the following section on Big Data) and deliver tailored marketing communications, such as recommendations based on their interests and experiences. This allows to deliver a personalised and unique value proposition (Živković *et al.*, 2014).

The use of social media and the consequent proliferation of user-generated contents, in addition to being a strategic source of information for tourism companies, has then unquestionably had an effect on the travel process in its entirety, including pre-travel, during travel, and post-travel stages. In the pre-purchase step, as mentioned above, UGCs represent an instant and reliable source of precious information that guide tourists in the development of their travel plan and also contribute to shape their expectations, which will be fundamental also in the post-travel stage, affecting the formative process of tourists’ satisfaction; during the travel UGCs are instead relevant in influencing perceptions on the tourist experience (Narangajavana Kaosiri *et al.*, 2019).

Furthermore, social media are nowadays a strategic imperative for destination branding strategies, aiming at promoting specific tourism destinations.

A tourism destination (TD) is referred to as a geographical area that provides visitors with the chance to participate in a diverse range of activities and attractions, as well as an area that is supported by all the hospitality and other services that the visitor might need during their stay. It is

essentially represented by a collection of physical sites in which tourists spend their time for the purposes of sightseeing both man-made and natural attractions, performing activities, such as swimming, skiing, and learning, and, more generally, spending their time by visiting bars, events, shops, restaurants, and other local services (Miah *et al.*, 2017).

According to Buhalis (2000), a destination can also be intended as a perceptual concept, which can be subjectively interpreted by customers. In this perspective, it can be dependent on a variety of factors such as prior travel experience and the aim of the visit, as well as psychographic and demographic characteristics of the destination. This term therefore refers to both the location with all its physical features and attractions and to the way these aspects are perceived and evaluated by tourists.

The concept of destination branding originates from a mix of tangible and intangible components. The idea of branding a location indeed encompasses much more than just a well-known name, distinctive logo, slogan, or symbol. The process of branding a destination is far more sophisticated. It represents a marketing strategy that incorporates practical, emotional, relational, and strategic aspects that, in their entirety, contribute to produce in the minds of customers a distinctive network of associations (Ruiz-Real *et al.*, 2020).

Because of the unique qualities that destinations possess as brands, it can be challenging to successfully transfer marketing strategies to locations such as cities, regions, or even countries. The branding process applied to tourist destination has been considered even more challenging than the one of consumer goods (Pike, 2005).

This process is made even more complicated by the fact that tourists themselves, by means of social media, actively participate in the co-creation process of experiences and, by sharing them, they also contribute to shape destination's identity. Therefore, tourists play a crucial role in the construction of a destination's image. The risk is that, as a result of this process, the final brand identity may not coincide with the intended one. Destination managers can then analyse tourists' behaviour on social media and consequently take actions. However, as brand managers, destination managers should avoid trying to control or manipulate the responses and communications of consumers. Rather, they should leverage this co-creative process enabled by social media and, in particular, take advantage of favourable experiences, which can turn out to be an extremely valuable asset in the construction of the destination brand, especially if expressed by influential users (Lund *et al.*, 2018).

Therefore, social media clearly represent a revolutionary communication tool for all the players operating in the tourism industry, for the purposes of marketing promotion, destination branding, community management and consumer interaction (Chu *et al.*, 2020).

3. Big Data: definition and impact on tourism industry

The aim of this section is to present an overview of the concept of Big Data (BD), of which social media represent a key source, and then clarify the role it plays in tourism industry and, specifically, on destination branding and marketing.

The term "big data" has been one of the most popular buzzwords for several years. Data is abundant in the era of the Internet of Things (IoT), and for years, academics and industry professionals have been investigating the implications of Big Data for various domains of development, including business (Sheng *et al.*, 2017). In the seminal paper that Bryson *et al.* wrote and published in 1999 in the Communications of the Association for Computing Machinery (ACM), the term BD was introduced for the very first time. In particular, applications built for the Web 2.0 platform and the proliferation of mobile devices further contributed to the increase in data volumes (Bryson *et al.*, 1999; Mariani *et al.*, 2018). The concept was later resumed by Doug Laney, an analyst working for META, which is now known as Gartner, who used a model called the 3Vs (further explained below) to describe the opportunities and difficulties resulting from the increase in data (Laney, 2001).

A widely accepted definition of big data is the following: “Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing that enable enhanced insight, decision-making, and process automation”. This definition places an emphasis on the three “Vs”: volume, velocity, and variety. Therefore, Big Data refers to datasets whose size is beyond the capability of typical database software tools to capture, store, manage, and analyse. Hence, Big Data has been originally defined and identified in terms of volume (it cannot be stored with ordinary tools since it exceeds the space limits), variety (data can take different forms, such as text, image, videos etc.) and velocity (data are created, modified, and spread at unprecedented speed) (Chen *et al.*, 2014; Manyika *et al.*, 2011).

However, there is no unique and universally accepted definition of Big Data linked to their size and this is mainly due to the constant advances in technology that lead to continuous changes in the sizes of datasets to be considered and identified as “big”. In point of fact, Big Data continues to expand around the globe on a daily basis, even on a second-by-second basis, primarily as a consequence of the growing number of Internet of Things devices in use.

Nevertheless, the definition of the 3Vs has been later expanded to include other additional Vs. A broader definition by Wu *et al.* (2016) includes 6 Vs: volume, variety, velocity, veracity, visibility, and value. More recent contributions have identified 5 additional Vs which constitute a comprehensive definition including 11Vs (Khan *et al.*, 2018; Owais and Hussein, 2016).

Here follows a detailed description of the 6 features.

Volume (Data in rest): this term refers to the scale of the data, which has a dimension that is enormous and has never been seen before. The ability to process large amounts of data is indeed the most significant contribution made by Big Data Analytics (BDA), the set of processes, tools and systems that are used to extract valuable and usable information from complex and enormous datasets. The following is the definition offered by the International Data Corporation (IDC): Big data technologies are a new generation of technologies and architectures designed to economically extract value from very large volumes of a wide variety of data by enabling high-velocity capture, discovery, and/or analysis of the data (Villars *et al.*, 2011).

Variety (Data in many forms): Big Data includes many different kinds of data, none of which have a predetermined structure, and none of which are prepared for processing because they are not in a perfectly ordered form. Big Data is not yet ready for use. Data can be highly structured (such as that which is obtained from relational databases), semi-structured (such as that which is obtained from web pages, social media feeds, raw feed directly from a sensor source, e-mail, etc.), or unstructured (video, images, audio, clicks).

Velocity (Data in motion): this feature not only refers to the rate at which new information is being received, but also to the rate at which it is being processed. This processing speed involves the creation of structured records, streams of data, and the availability of information to be used as input for decisions. The speed at which the entire process, including the feedback loop, moves data from the input stage to the decision stage is an important ability.

Veracity (Data in doubt): it is a matter of trustworthiness of data sources and then, a matter of data consistency with truth or fact. This feature is associated to accuracy, certainty, and precision of data.

Veracity is a question of whether or not the data in question can be trusted. Inconsistencies, model approximations, ambiguities, deception, fraud, duplication, incompleteness, spam, and latency are all potential factors that could contribute to uncertainty. When there is a lack of certainty surrounding the data, the findings cannot be demonstrated as fact but can at most be considered probable.

Value (Data in highlight): when data are processed and analysed in the appropriate manner, they take on a certain value. In point of fact, this is the ultimate goal of the Big Data technology.

By performing high-velocity data capture, discovery, and/or analysis, the main goal is to economically extract value from Big Data which, as stated above, is characterised by large volumes and wide variety, thus making this process very challenging (AGCOM, 2020; Kacfeh Emani *et al.*, 2015). Enhancements in the analytical field (replacing or supporting human decision, discovering

needs, segmenting populations to customise actions) and a leverage for new business models, products, and services are the two primary benefits that come from this value.

The last two characteristics included in the 6 Vs model are visibility and variability.

Visibility is associated to the importance of having a complete picture of the data in order to make decisions that are fully informed.

Variability (refers to visualisation) is an additional quality that has been uncovered in a number of separate studies. Actually, in addition to the growing velocities and varieties of data, the number of variables in data sets can change on a daily basis or as a result of seasonal events that cause peaks of data (Bresciani *et al.*, 2021; Verma *et al.*, 2016).

Validity concerns the idea of correct data, suitable for the intended application (Owais and Hussein, 2016).

Volatility refers to the fact that some data can be destroyed as the retention period stated by the policy expires (Owais and Hussein, 2016).

Viscosity deals with the complexity in managing heterogeneous data with internal interdependencies (Khan *et al.*, 2018).

Viability is linked to the need to identify latent and hidden relationship among the so many types of data and variables available (Khan *et al.*, 2018).

Big data are playing a vital role in the evolution of global travel in this era of digital transformation, bringing significant opportunities for organisations operating in the tourism industry and for the territories in general.

This section aims at exploring how such a disruptive innovation as the one represented by Big Data and Big Data Analytics can actually affect tourism.

Big data applications for the hospitality and tourism industries have been rapidly developing as a result of recent technological advancements in database management systems and analytical tools. The availability of data from external sources, and the development of sophisticated and advanced technologies that make it feasible to analyse these data have paved the way for big data analytics to become a reality. Companies have always had their own internal data, but with the introduction of new technology and additional external data, they are now able to obtain insight into how they may enhance their relationships with customers as well as their operations. Therefore, the availability and analysis of Big Data supplies more detailed and precise information on guests. Big Data analytics are for example frequently used to acquire insights on hotel guests from user-generated contents posted on social media. In the current era, customers are indeed willing to share copious amounts of feedbacks regarding their positive and negative experiences at hotels, restaurants, and other travel destinations (Bowen and Whalen, 2017). These reviews, if adequately analysed, can represent a good starting point to improve customer satisfaction.

Another advantage of Big Data is represented by the possibility for managers to use it to improve effectiveness and efficiency of operations. Kahn and Liu (2016) explore how Big Data on monthly electricity and water consumption can be exploited by hotel chains who have access to it. In their study, they discovered a significant amount of variation in the amount of electricity used per occupied room, thus suggesting the existence of uncovered patterns in the data. This data can be used to increase energy efficiency dynamics. The authors outline a method for making use of such data with the purpose of simultaneously cutting down on operating costs and making progress toward broader sustainability objectives (Kahn *et al.*, 2016).

Another interesting application of big data adoption in tourism is linked to destination marketing, which leverages local attractiveness of territories indented as tourism destinations.

Indeed tourists, throughout their trips, as well as in their processes of decision-making and communication, actively contribute to the generation of a large flow of data that is generated by sensors, micro-devices, and cameras. The data is spread on urban and extra-urban sites that are of interest to tourists and can be used as valid starting point for both the creation of what are considered “smart destinations” and the enhancement of the capacity of tourism businesses to tailor the products and services they supply to customers (Ardito *et al.*, 2019). TDs are commonly managed and advertised by destination management organisations (DMOs), who also interact with

the local tourist industry and plan several development initiatives. The vast amount of data generated by tourists on the Internet may provide extremely useful insights to DMOs to improve their activity. This precious information on tourists' behaviour shared on social media and on other websites, that are particularly difficult for local authorities to collect, holds a great potential since they can reveal to destination managers which locations are preferred by tourists, which factors mostly attract them, and what are their future travel intentions (Miah *et al.*, 2017). An interesting reflection should be made on the various roles that the internet and the data generated by means of it can play. On the one hand, tourists themselves use this modern communication channel to express their opinions on the destinations they visit, thus producing the so-called user-generated contents which, to some extent, shape the overall image and reputation of the location and have also the power to influence the perception of future visitors about a certain location in the process of selection of their vacation destination. On the other hand, the internet has become the medium that tourists most frequently adopt to acquire information; as a result, the existence of a tourist attraction within the context of the digital environment is of the utmost importance. Destination marketers should then place a great deal of emphasis on the contents they produce to advertise a location, since they are an increasingly powerful tool. A key aspect of this mechanism is that the above-mentioned UGCs may be leveraged to increase the efficiency of marketing of tourism destinations by means of Big Data Analytics, which enables a better management of online reputation and, consequently, provides insights to increase online competitiveness of destinations (Cillo *et al.*, 2019).

Therefore, in this Big Data environment, the effect of investing on Big Data Analytics to extract usable insights from the data can be seen as twofold. All the different businesses involved in the tourism industry (from hotels to airline companies) can benefit from it to implement enhanced marketing strategies, which turn out to be particularly relevant in those contexts characterised by intense competition and exacting and experienced customers. Big Data Analytics may support these businesses in improving their strategic and operational decision-making, and in the value-generation process, thus facilitating them in their attempt to get and maintain a competitive advantage (Mariani *et al.*, 2018). These companies, by leveraging customer knowledge, become able to deliver the best service possible, with respect to customer requirements, at the right place and at the appropriate time (Centobelli and Ndou, 2019). Enlarging the scope from the single businesses operating in a certain location to the location itself, BDA benefits can be extended to the competitiveness of the overall tourism destination. If TDs perform the appropriate analysis on big data dataset containing for example information in the form of tourists' feedbacks, reviews, photos and messages (which are unstructured data), the results may be of help for tourism destination managers to construct consumer-metrics-based frameworks that are useful to classify tourist segments, track tourists' perceptions and attitudes and make predictions on future strategic patterns. Furthermore, as a result of BDA, destinations that rely on tourism can now offer enhanced and personalized services to visitors, in line with the idea of smart tourist destinations (Cillo *et al.*, 2019).

Proposition 1a: Social Media channel empowered by Big Data positively affects tourism demand of a destination. It increases the effectiveness of destination management actions to attract tourists, by influencing travellers' decision-making process.

Proposition 1b: Social Media channel empowered by Big Data enables the adoption of a customer-centric view, thus enhancing the quality of personalised touristic experience. The increased quality is due to the possibility for tourists to optimize the experience itself by spending their limited time in those activities they find enjoyable.

4. The emerging role of low-cost carriers in tourism industry: impact on destinations choice

As stated by Kaul, (1985: 496), "transport plays an important role in the successful creation and development of new attractions as well as the healthy growth of existing ones. Provision of suitable

transport has transformed dead centres of tourist interest into active and prosperous places attracting multitudes of people.”

When it comes to compare transportation choices made by tourists worldwide, considering Air, Road, Water and Train as alternatives, 59% of tourists decided to travel by airplane in 2019. Air transportation is therefore crucial for worldwide touristic flows (Statista, 2019).

It raises relevant considerations on the relationship between the transportation mode and the destination choice.

The selection of a tourism destination and airline is not a simple process. Such selection process nowadays requires the analysis and evaluations of numerous options before deciding on the best solution. Various factors are transforming this process, making it particularly complicated on one hand, but also simpler on the other hand. A first factor is represented by the dramatic increase in the number of destinations competing with each other's for the attention of potential visitors. Secondly, travellers are becoming more and more autonomous in the selection and booking process, without resorting to the help of traditional intermediaries (i.e. travel agencies and incoming tour operators), thus relying on direct sales channels and online booking website. This happens as a result of the significantly enhanced digitally enabled accessibility to travel information. Other factors are the following: the emergence of several forms of tourism (i.e. urban, rural, nature, historic, luxury), lowered travel costs and the consequent increased travel frequency. However, it should be kept in mind that the selection process always begins with two major constraints: time and money budgets for the upcoming journey (Jacobsen and Munar, 2012; Krakover and Corsale, 2021).

Tourism literature has investigated how travellers make their choices in light of the above-mentioned renewed characteristics of tourists' decision-making process, recently focusing on the influence of airline companies, which are gaining increasing market power because of the tendency of travellers to directly book from their websites. For this reason, airlines also started to collaborate with online travel agencies (i.e. Booking) and other online service providers (i.e. rental cars agencies) offering combinations of travel and accommodation solutions.

A recent contribution study the sequencing effect in a choice experiment and find out that, depending on the order in which travellers receive information about airlines and tourist destinations, visitors may assess tourism destinations differently when confronting a decision. In particular, they suggest that having chosen the airline option, passengers are more likely to select the same tourist alternative in the second stage while the opposite is not true (Keshavarzian and Wu, 2021)

From the tourism demand point of view (Koo *et al.*, 2017), transport accessibility is strongly influential, and the availability of direct air services and tourism demand are therefore endogenous. Since airline companies mainly rely on the existing demand pattern to define their future plans and schedules, thus contributing to further reinforce the existing demand pattern. This planning mechanism, typically adopted by the incumbent companies, is consistent with a hub-and-spoke approach and negatively impacts on peripheral destinations. However, it has been raised the idea that the availability of flights to reach peripheral locations may cause an increase in tourism demand of that destination, considering aviation as a supportive factor for international tourism.

This is consistent with the point-to-point business model adopted by low-cost companies.

In this perspective, another factor not to discard in the attempt to describe the transformation of tourism industry, is the evolution of the aviation market, with the growing market share of low-cost airlines.

This growth was envisaged in the past (Passport, 2019) and has been confirmed by ex-post data (Eurocontrol, 2022). This is the result of a modernisation process within the air market in conjunction with the emergence of digital platforms. Before the 20th century, international aviation was dominated by flagship airlines - mostly public-owned and part of airline alliances - also called full-service airlines (FSC), offer differentiated cabin classes and originally linked capital cities. Charter carriers (CCs) were developed to serve destinations located far from capital cities, but they were characterised by low profitability and severe demand volatility, but they provided some additional services such as accommodation and excursions. Low-cost (LCC) airlines emerged as a

solution to connect regional airports with low frequency, by offering a single type of cabin class and no additional services. A critical and innovative feature of LCCs is that they used websites as major distribution channel, cutting costs deriving from travel agency intervention. Lower costs are the main advantage of online booking, and this is true not only for transportation but also for accommodation, whose market has been disrupted by the use of online booking portals (Eugenio-Martin & Perez-Granja, 2021).

Focusing on the destination decision-making process, the *sieving concept* (Krakover and Corsale, 2021) represents the modern approach such process, which is nowadays a fast and easy traveller journey experience based on the use of several digital touchpoints. This new paradigm is the results of some renewed contextual conditions (availability of a greater number of destinations, lowered costs) as well as of the transformed tourists' habits (book by themselves and more frequently). The sieving tourism destination process is described as a simplified and fast step-by-step process, made less risky by the information available online and by the willingness of travellers to consider the discarded destination as an option for a future trip.

Since tourism researchers agree upon the idea that the attractiveness of a destinations toward visitors strongly depends on the availability of affordable transportation (Álvarez-Díaz *et al.*, 2019), and given the idea in tourism literature that air transport accessibility can support the touristic development of an area (even peripheral locations), in light of the empowerment of low-cost airlines, we argue that the availability of low-cost flight is able to determine an increase in tourism demand of the relative destination. A market overlap between destination management and low-cost airlines management can lead to more efficient strategic behaviours for both the actors, adopting a shared value approach (Porter and Kramer, 2011) to create value in a customer-centric perspective.

Proposition 2: Low-cost airlines, digital by inception, with their decisions on which destination to serve influence tourism demand of both already served and popular destinations and less popular tourism destinations.

Proposition 3: The collaboration between decision makers acting on destination and low-cost carriers' side, boosts the growth of local touristic flows. The adoption of such complementarity approach increases the overall efficiency of their decision-making process.

5. Conclusion

In the last decades, several challenges have affected the travel and tourism industry. We derive four propositions on Social Media, Big Data and the emergence of Low-Cost carriers, plying a relevant role for the attractiveness of a touristic destination. On one hand, we suggest that Social Media empowered by Big Data for the development of tailored messages, positively affects local tourism demand as well as the quality of destination experience in a customer-centric perspective. On the other hand, we state that low-cost airlines' decisions making on destinations influence local demand of both served popular destinations and less popular ones. Moreover, we propose that the collaboration between decision makers acting on destination and low-cost carriers' side leads to efficient strategic behaviours in developing territorial wealth.

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Sport Facilities of Eastern Macedonia and Thrace Region in Greece. A Project for Sport Development

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Abstract

Framing of the research. *A sports facility can be the key for the development not only of sport, but of the whole social, cultural, political and tourist development of the region. In order to contribute to the improvement of the operation and ensure the development of their sports facilities, the sports organizations of the local authorities must define a policy.*

Purpose of the paper. *The purpose of this research was to investigate and record the sport facilities of Eastern Macedonia and Thrace Region in Greece and to identify the opportunities and the threats for the sport development of this area.*

Methodology. *Regional Association of Municipalities of Eastern Macedonia and Thrace (RAMEMT) in Greece is consisted of 22 Municipalities and represents one of the 13 Regions. The sample of this research was the staff of the sport offices of RAMEMT. For the purpose of the research, a questionnaire was created in Google Forms.*

Results. *The recording of the sports facilities of the local government identified their shortcomings and weaknesses in order to plan the changes that will contribute at the sporting development of municipalities, for the benefit of society.*

Research limitations. *The research was conducted at the north-east part of Greece.*

Managerial implications. *Through the development of sport by the utilization of sports facilities, the Municipalities will also contribute to the improvement of social conditions, as the possibility of sport is a privilege for all, far from discrimination and social exclusion, giving space to both the disabled and special population categories.*

Originality of the paper. *This paper is the first presentation of the results of the project which was funded by the Regional Association of Municipalities of Eastern Macedonia and Thrace (RAMEMT) in Greece.*

Key words: *sport facilities; sport management; sport development;*

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1. Introduction

The local authorities are the only organizations in the country that own all sports and school facilities within their jurisdiction and organize sports programmes aimed at improving health, entertainment and the use of citizens' leisure time. In addition, they implement sport and recreational programmes for vulnerable social groups (e.g., people with disabilities) and for groups of citizens who usually refrain from sport (e.g., adolescents, elderly people, etc.) (Alexandris & Balaska, 2015a; Balaska & Kouthouris, 2014).

One of the biggest obstacles of the development of sports organizations, which creates other problems (e.g. lack of staff, technological resources, necessary materials, etc.) is the lack of financial resources. In order to strengthen themselves financially, sports organizations can seek partnerships, sponsorships and participation in European programmes, as well as investment programmes (Balaska, 2021).

In response to the challenges posed by globalization and competition between cities, many are trying to attract new residents by portraying their cities not only as good places for entrepreneurship, but also as good places to live (Taks, 2013). They promise a quality living environment, with a wide range of recreational and sporting opportunities, in a safe and attractive environment. Moreover, many cities are interested in hosting sporting events because they see them as an effective way to strengthen the local and national economy and to improve the city's image (Niemelä, 2009).

Following the above trend and in parallel with the actions of sport for all, the local authorities of the country undertake the organization of local sports events, which include one or more sports. Their ability to attract visitors - tourists, their positive economic impact, and their wide media coverage make them important tools in the development of strategies for the promotion of tourism destinations (Alexandris & Balaska, 2015a; Smith 2008).

Sports events organized by municipalities are mainly local events, which are addressed to local communities. These events confer prestige, strengthen the sense of unity, encourage participation in sports and promote the formation of positive attitudes towards sport. The popularity of sporting events can be attributed to the fact that, depending on their size, they generate significant benefits for the host communities at state, county, city or municipality level (Avloniti, Yfantidou, Kouthouris, & Costa, 2022). Organizing them throughout the year can lead to a widening of the period of high tourist attendance and thus bring economic benefits to the host city not only during the event but also over a longer period of time. The multiple benefits of organizing sporting and cultural events encourage authorities to actively support these events (Avloniti, Yfantidou, & Kouthouris, 2023; Balaska, 2021; Kwiatkowski & Oklevik 2017; Teare & Taks 2021).

1.1 Purpose

The purpose of this research was to investigate and record the sport facilities of Eastern Macedonia and Thrace Region in Greece and to identify the opportunities and the threats for the sport development of this area.

2. Literature Review

2.1 Sport Facilities

Sports facility means all the buildings and infrastructure (playing field, stands, changing rooms, auxiliary areas, etc.), as well as the surrounding area, which is delimited according to the spatial distribution of the area (Ministerial Decision 38404/2009 - Government Gazette 1780/B'/26.8.2009 - Approval of the Unified Safety Regulation for Sports Events) (<https://gga.gov.gr/>). Sports facilities are classified according to their use into Competitive Sports

Facilities and Recreational Sports Facilities. A sports facility can be the key for the development not only of sport, but of the whole social, cultural, political and tourist development of the region (Alexandris & Balaska, 2015b; Thibault & Harvey, 2013).

2.2 Competitive Sports Facilities

The facilities for competitive sports host the training and championship activities of athletes, clubs, national teams, as well as the fans who attend the training sessions and matches. The playing field is the scene of intense competitive activity, while economic and social activity develops around it.

Sports facilities for competitive sports in Greece belong to one of the following bodies:

1. Hellenic Olympic Committee - HOC: They are called “Olympic” and are used for the preparation of Olympic-level athletes, as well as for the organization of highly competitive competitions.
2. General Secretariat of Sports - GSS: Most facilities are built by this public authority, which has sole responsibility for them and the right to appoint management committees.
3. Local authorities: Municipalities create mainly small sports and recreational facilities, as well as training and competition venues for their citizens.
4. Ministry of Education and Religious Affairs: This Ministry owns the sports and recreation facilities of the institutions of Primary, Secondary and Higher Education.
5. Ministry of National Defense: This Ministry owns the sports facilities in military camps and military schools.
6. Sports clubs: They own sports facilities.
7. Individuals / Businesses: There are small-scale facilities such as 5x5 courts, gyms, tennis courts in this category.

(Balaska, 2021)

Sports facilities include a wide range of buildings and outdoor areas of various sizes and shapes, as well as related equipment. Regardless of the size and category of the facility, specific standards must be met in their design and construction in accordance with international and national legislation.

Basic venues for the installation of Competitive Sports:

- Racing venue
- Changing rooms - athletes’ service areas
- Stands
- Auxiliary areas
- Media service facilities
- Administration offices and staff working offices
- Parking areas

(European Commission, 2018)

2.3 Recreational Sports Facilities

Recreational sport refers to sports and physical activities that aim at the recreation of the person who participates and not at competitive competition. Recreation is defined along 3 dimensions:

- A) Recreation as leisure time (recreation is approached as anything that is not work).
- B) Recreation as an experience (free choice of participation activities for the individual).
- C) Recreation as an activity (specific activities such as walking and non-sporting activities such as artistic events) (Hofmeister, 2019).

Sports Recreational facilities include:

- children’s camps
- 5X5 football pitches
- companies organizing water sports activities

- recreation at hotels
- SPA, thermal springs and thalassotherapy centers
- theme parks
- playgrounds (infant and toddler)
- playgrounds
- squares and neighborhood parks
- sports centres
- municipal parks
- specialised facilities
- woodland trails for hiking, climbing, cycling, horse riding, or moto-cross, etc.

2.4 Accessibility of sports facilities

Accessibility is the ability of a place, piece of equipment or service to be accessed and used by all users, without exclusion or exclusion of any category of users. Sports facilities should follow international accessibility standards in order to serve all categories of users, including persons with disabilities, from the same places and with the same level of quality of service (Darcy, 2010; Yfantidou, Zioumbiloudi, & Balaska, 2018).

Key points that must be met as a minimum are:

- Parking - drop-off and pick-up points: clearly marked car parking spaces close to the wheelchair ramp.
- Entrances: Good signage at access points.
- Spectator seating: Wheelchair spaces in the stands, or near the pitch, in a safe place
- Sports grounds: ramps and specially designed access points.
- Sanitary facilities: toilets for people with disabilities with signage near the wheelchair spaces.
- Support spaces: Lifts on each floor, space for wheelchair access at the canteen area and for all services provided.
- Guesthouses: Special configuration for wheelchair access.
- Changing rooms: Special designed for wheelchair access

2.5 Opportunities and benefits strands from Sport Facilities

2.5.1 Social benefits

Exercise has been linked to health, wellbeing and prosperity and municipalities contribute to improving the wellbeing of their citizens by providing sport facilities and programmes. Sports facilities (indoor and outdoor) and outdoor exercise areas (e.g., parks, outdoor gyms, trails, etc.) are places of exercise, recreation and socialization for citizens, making a significant contribution to improving their quality of life. A sports facility that hosts games from various sports (basketball, volleyball, handball, etc.) and a variety of events (festivals, tournaments, etc.) becomes a reference point in the region, is recognized at local, national and international level and the residents feel proud and enjoy the benefits of this recognition. The benefits refer to the promotion of the community and the enhancement of its image, the added value of the area, the positive feelings of the residents and the improvement of the quality of life through the improvements and redevelopment of the area where the sports facility is located (Fernández-Martínez, Cabello-Manrique, Francisco Roca-Cruz & Nuviala, 2022).

2.5.2 Economic benefits

The operation of a sports facility results in economic benefits from: a) the income by the users of the facility, such as the athletes in the sports programmes of the Municipality, the sports clubs, the

entities that rent the facility for an event, b) the rental of the facility's premises, such as halls, canteen, gym, offices, etc., and c) the increase of the local economy, because it attracts new businesses in the area, such as catering shops, sports clothing and footwear, sports equipment, etc. Users, visitors, spectators, employees and suppliers are regular customers of businesses operating near the sports facility and this number increases significantly when an event is hosted (Fernández-Martínez, et. al. 2022). When a sports facility hosts sports events of national, European or international level, the number of visitors increases even more, thus increasing consumption in local businesses, advertising the area, and improving the visibility of the sports facility for future visits. All this contributes to the increase of the economic activity of the region by creating new jobs, fighting unemployment, creating new businesses, increasing services and tourism. In terms of employment, hosting sporting events in sports facilities has a direct impact on tourism employment because tourism activities are characterized as labour-intensive, as their production processes are based on the services provided by the human resources involved (Chalip, Green, Taks & Misener, 2017).

2.5.3 Environmental benefits

The creation of a new sports facility in an urban environment must be in harmony with the social, economic and urban reality of the city. The facility must be part of the city's development programme expressed in the urban plans: land use, buffer, general layout and town planning. By redeveloping the area with respect for the environment, creating a road network for quick and easy access to the sports facility and creating green spaces, the objective value of the real estate in the area is increased. Cleanliness, recycling, reduction of energy consumption, pollutants and noise help to develop the area while protecting the environment. During the initial planning of the construction of sports facilities, environmental criteria are taken into account, which upgrades the area ecologically in terms of biodiversity and microclimate and increases the attractiveness of the residential environment. Sports facilities must take into account all environmental factors, so that interventions are carried out in harmony with the microclimate of the area and all its actions support the sustainability and viability of the sports facility, thus ensuring environmental protection and rational management of natural resources (MacIntosh, Apostolis & Walker, 2013).

2.5.4 Developmental benefits

Sports facilities are expensive to maintain and operate, but they are essential for the promotion of exercise, sports development and sports participation throughout the country. National and European funding programmes enable sports facilities to be built, repaired and maintained, the surrounding areas to be landscaped and the general area to be upgraded. The upgrading of the sports facilities provides the opportunity for their successful utilization either through partnerships with professional and amateur sports clubs for hosting reasons, or large sporting events that will bring income to the local community, advertise the area and contribute to the tourist development of the Municipality or the Region (Fernández-Martínez, Tamayo-Fajardo, Nuviala, Cabello-Manrique, Nuviala, 2021; Funk, Jordan, Ridinger & Kaplanidou, 2011).

3. Methodology

3.1 Sample

This research was funded by the Regional Association of Municipalities of Eastern Macedonia and Thrace (RAMEMT) in Greece. RAMEMT is consisted of 22 Municipalities and represents one of the 13 Regions of Greece. The sample of this research was the staff of the sport offices of RAMEMT, in particular 45 people (31 men and 14 women) were participated.

3.2 Questionnaire

For the purpose of the research, a questionnaire was created in Google Forms. In particular the questionnaire consisted of 103 questions of which 49 closed and 54 open. The questions were about contact details, local authority / status of ownership, management of the sports facilities, competent service unit in the current internal service organization of the municipality, regulations, scope of the facility, “Pelopas” platform for sports facilities registration, general presentation of the facility, schedule of operation, exploitation - activities, concession procedures, maintenance, facility equipment, facilities for athletes, service areas for athletes, lockers, auxiliary areas, press service - technology, operating systems, general accessibility of the facility / parking areas, entrance / exit control, access to the facility, accessibility for people with disabilities, staffing, employment relationship and categories of staff employment, provision of first aid, donations / sponsorships, etc.

3.3 Process

The research team contacted a communication with all Municipalities for the appointment of a representative on sports issues in each Municipality and coordinated the procedure. The staff of the sport offices received by email a link for the completion of the questionnaire. Once the survey team had collected all the questionnaires, they proceeded to analysis. These questionnaires identified deficiencies and explored the potential of the sports facilities.

4. Results

4.1 Status of ownership

In response to the question on ownership status, 94.1% answered that the facilities belong to the Municipality, while 5.9% to a Public Law Entity.

4.2 Monitoring at political level

At the political level, supervision is carried out by the deputy mayor (74.2%), the mayor (24.2%) and other (1.5%).

4.3 Responsible department

The responsible department in the current Internal Service Statute of the Municipality is a department in a Directorate (75%) and other (25%).

4.4 Existence of regulations

In the question regarding operating regulations, 85.5% responded that there are operating regulations, 38.7% that there are program regulations, 12.9% that they did not know, 3.2% that there are instrument use regulations and 1.6% that there are other regulations.

4.5 Regulation of the operation of sports facilities

Tab. 1: Regulation on the operation of sports facilities

The purpose of the facility, the duties and obligations, the days and hours of operation, the procedures to be followed in all matters relating to the operation of the facility	85,5%
The duties and obligations of the management	83,9%
The procedure for the concession of the facilities and equipment to associations/organizations/citizens	82,3%
The obligations for clubs arising from the concession and the procedure for holding matches and events	80,6%
The process of maintenance - repair of the facility	62,9%
The procedure for dealing with emergency situations	29,0%
Does not Know	12,9%
Procedure for dealing with injuries	0%

4.6 Facility range based on the standards

When asked about the scope of the facility, the standards of each sport and the activity it hosts - level of matches, 95.6% responded that it hosts local level matches, 33.8% that it hosts regional level matches, 27.9% that it hosts national level matches, 7.4% that it hosts inter-Balkan level matches, 4.4% that it hosts European level matches, 2.9% that it hosts international level matches, 1.5% that it is a training facility.

4.7 PELOPAS platform questions

- Did you fill in only the mandatory registration fields? 50.7% = Yes, 49.3% = No.
- Did you have all the data available? 11% = Yes, 89% = No.
- Are there any sports facilities that are not licensed? 50% = Yes, 50% No.
- Did you encounter any difficulty in the way the data was recorded on the platform? 47,6% = Yes, 52,4% = No.

4.8 Difficulty in recording data

When asked about difficulties in recording data, 57.1% responded that they did not save the record, 28.5% that some options were not responsive, and 14.2% responded that they had difficulty entering coordinates and uploading photos.

4.9 Type of facility

In the question related to the type of facility, 49.2% are football stadiums, 20% are open stadiums, 12.3% are indoor gyms, 7.7% are sports centers, 7.7% are indoor gyms and finally 3.1% are national stadiums.

4.10 Utilization of sports facility

In the question regarding the utilization of the sports facility, 96.9% answered that it is used by clubs for training, 83.1% for sporting events, 70.8% for competitive activity of clubs, 46.2% for sports programs for all, 41.5% for educational programs - organized visits to the facility, 30.8% for rental for other reasons and 29.2% for rental by private entities for conferences / meetings.

4.11 Concession procedures

Tab. 2: Concession procedures

Application by the person/club concerned	89,1%
Written concession procedures	68,8%
A private agreement setting out the details of the concession, safeguards and security conditions in the event of damage	26,6%
A declaration of acceptance of the operating regulations and a decision by the city council	21,9%
Without any procedure	1,6%

4.12 Recipients of services

Tab. 3: Recipients of services

Amateur sports clubs	98,5%
Sports associations	80,6%
Organisers of sporting/cultural/entertainment events	62,7%
Federations	44,8%
Natural entity	43,3%
Citizens freely engaged in sport	41,8%
Departments of sport for all programmes and cultural associations	40,3%
Sports camps for team and individual sports	37,3%
Associations for people with disabilities, public enterprises and individuals for personal training and fitness services	35,8%
Professional sports clubs and organizations for training tourism services and spiritual centers	34,3%
Scientific organizations for the organization of conferences - seminars, legal entities under public law and legal entities under private law	32,8%
Organizations	31,3%
Chambers	29,9%
Work centers and commercial activities	28,4%
Other	1,5%

4.13 Allocation of uses to entities

In the question on the allocation of use to entities, 97% answered that it is free of charge, 16.4% depending on the case, 11.9% with a monthly fee and 1.5% that it is done in another way. No replies were received for an annual fee and short-term fee-based concession agreements.

4.14 Conservator of the facility

In response to the question regarding the maintenance provider, 66.7% responded that it belongs to municipality services, 28.3% that it is a contractor, and 5% that it is a private partner.

4.15 Existence of a periodic inspection and maintenance programme

In response to the question on the existence of a periodic inspection and maintenance program for the facilities, 47.4% responded that the program is semi-annual, 42.1% that it is weekly, 13.2% that it is annual, 5.3% that it is daily and 2.6% that it is monthly.

4.16 Type of use

In the question regarding the type of use, 48% responded football hall, 28% responded basketball hall, while 4% responded handball hall, 4% responded muscle strengthening-weight room, 4% responded gym, 4% responded aerobic - fitness room, 4% responded multi-purpose room, and 4% responded other.

4.17 Floor material

Tab. 4: Floor material

Floor material	%
Grass	66,1
Wood parquet	21
Safety tiles	6,5
Cement	3,2
Natural turf, tartan-type rubber turf	3,2
Soil	3,2
Rubber	1,6
Cast flooring	1,6
Rollflex rubber carpet	1,6
Plastic flooring	1,6

4.18 Existence of a perimeter security zone

When asked about the existence of a perimeter security zone, the most popular answer was “Yes” (84.1%), followed by “Don’t know” (13.6%), while only 2.3% said that there is no perimeter security zone.

4.19 Existence of demarcation lines

When asked about the existence of demarcation lines, the most popular answer was “Yes” (83.9%), followed by “Don’t know” (10.7%), while 5.4% stated that there are no demarcation lines.

4.20 Athletes’ facilities

With regard to the facilities for athletes, the tables show the percentages in terms of number and square meters.

Tab. 5: Changing rooms

Changing Rooms			
Number	%	Dimensions	%
1-2	10	10cm ²	16,7
3-4	70	15cm ²	16,6
5-6	15	25cm ²	66,7
10+	5		

Tab. 6: Shower facilities

Shower facilities			
Number	%	Dimensions	%
1-2	11,1	4 cm ²	50
3-4	44,5	5 cm ²	25
5-6	11,1	6 cm ²	25
>10	33,3		

Tab. 7: WC

WC			
Number	%	Dimensions	%
1-2	15,4	2 cm ²	40
3-4	46,2	4 cm ²	60
7-8	15,4		
>10	23		

4.21 Stands

Regarding the stands of the sports facilities, the largest percentage (48.9%) answered that there are chairs in the stands, 44.4% that they are developed by concrete, 28.9% that there are fixed stands, 15.6% that they are detachable, 6.7% that they are wooden, while 2.2% answered that there are no stands.

4.22 Number of seats

For the total number of seats, most (33.3%) responded that they range between 200-400, 29.8% that they range from 0-200, 14.8% that they are >1000, 14.7% that they range between 400-800, while 7.4% responded that they did not know the number of seats.

4.23 Possibility to place additional seats on the pitch

Regarding the possibility of placing additional seats on the pitch, the most popular answer was “Yes” (55.5%). 11.1% of them stated that there is a possibility of placing 500 additional seats. Also, 11.1% each stated “there is only the possibility of placing 50”, “No” and “I don’t know”.

4.24 Seating capacity

For total spectator capacity, the highest frequency (35.7%) occurred in facilities with 200-400 seats, 35.7% responded that seats ranged between 0-200, 14.3% responded that seats ranged between 400-800, and 14.3% responded that seats were >1000.

4.25 Existence of places for people with disabilities

In relation to the existence of places for people with disabilities, 84.6% stated that there are, while 15.4% stated that there are no places for them.

4.26 Existence of a seating plan

In response to the question on the existence of a seating plan, the majority (47.8%) stated that they did not know if there was one, 34.8% stated that there was none, while only 17.4% stated that they have.

4.27 Auxiliary areas

Tab. 8: Auxiliary areas

Auxiliary areas	%
Material warehouses	75,5
Engine room	65,3
Administration offices	59,2
Organised treatment room with first aid equipment	51
Canteen	38,8
Staff working areas / offices	30,6
AED/CPR Rescue Kits storage area	22,4
Conference room	21
Laundry/dryer	16,3
Visitors' waiting room	8,2
Technical repairs and maintenance	6,1
Sauna	4,1
Cafeteria	4,1
Physiotherapy room	3,2
Screening room	2
Medical services/doping control area	1,6

4.28 Technology - Press Services

Tab. 9: Technology - Press Services

Technology - Press Services	%
Telephone line	94,4
WiFi - wireless network	72,2
Wired network	44,4
Special room for interviews / press conference	27,8
Special room for live media coverage / TV broadcasting	27,8
Photocopying machine	22,2
Electric substation	17,7
Press office with computer	16,7
Satellite antenna	-

4.29 Lighting

Regarding lighting, 95.3% said they use halogen bulbs, 12.5% use LEDs, while 1.6% use other types of lighting.

4.30 Heating / cooling

For the heating and cooling mechanism, 62% stated that it runs on electricity and 62% on oil, while only 2% use natural gas or 2% use something else.

4.31 Ventilation

When asked if the facilities have a ventilation system, 50% answered positive, 31.2% said they did not know, while 18.8% said they did not have one.

4.32 Acoustics

In the question regarding the quality of acoustics the most popular answer claimed that it was average (57.1%), followed by the answer that it was considered poor (21.4%), only 10.7% claimed that it was very good, 7.1% rated it as good and finally 3.6% considered the acoustics very poor.

4.33 Fire protection

When asked whether there is fire protection, 63.2% answered that there is, 23.7% that they do not know, while 13.2% that there is none.

4.34 Anti-theft protection

In the variable on anti-theft protection, 50% stated that there is an alarm system, 33.3% stated that they do not know, 22.2% have created special fencing, while only 5.6% are protected by 24-hour security.

4.35 Car parking spaces

Tab. 10: Car parking spaces

Car parking spaces	%
Spectators	96,4
Media	96,4
Personnel	98,2
Administration	98,2

4.36 Existence of space for the approach, parking and manoeuvring of vehicles necessary for the conduct of an event

When asked about the existence of space for the approach, parking and manoeuvring of vehicles necessary for the conduct of an event (e.g., ambulances, fire trucks, patrol vehicles, cleaning/transportation vehicles for equipment and materials, special TV broadcast vehicles, etc.), 94.6% said they have it, 3.6% did not know, while only 1.8% of facilities did not have it.

4.37 The entry/exit control

Control for entry and exit in the premises is most often done with the supervision of a guard (67.4%), 19.6% are not aware of the existence of a system, 17.4% use another procedure and method and finally, with a percentage of 4.3% equally, control is done with an electronic system, user card and attendance book.

4.38 Access to the facility

In terms of access to the sports facilities, driving from the city center was the most popular option (100%). This was followed by walking (44.3%), by city bus (37.7%) and by municipal bus (9.8%). 4.9% stated that there is a nearby port, 3.3% stated that there is access to a nearby airport and only 1.6% stated access by train.

4.39 Instructions recorded on the municipality's website or in hard copy with alternative ways of accessing the sports facility

Regarding the instructions recorded on the municipality's website or in printed form with alternative ways of accessing the sports facility (means of transport, timetables, travel time from hubs, airport/railway/bus station/city transport, etc.), 59.6% stated that they have taken care of this, 25.5% have not created instructions and 14.9% stated that they do not know if there are instructions.

4.40 Map of the location of the facility and access from junction points

To the question whether there is a map of the location of the facility and access from junction points, 51.5% answered positively, 27.3% answered negatively and 21.2% answered that they did not know.

4.41 Permanent staff of the municipality employed at the sports facilities

Tab. 11: Permanent staff of the municipality

Specialization	Permanent staff of the municipality employed at the sports facilities					
	0	1	2-3	4-6	7-10	10+
Administrative staff	17,6	25	23,5			
Physical Education & Sport Science Instructor	10,3		2,9			
Plumber	2,9	8,8				
Electrician	8,9	1,5				
Maintenance technician	10,3	1,4	1,4			
Fire safety technician	10,4					
Safety technician	10,4					
Occupational Safety Officer	10,3	2,9				
Cleaning staff	8,8	25	1,4			
General duties staff	10,3	16,2	2,9	1,5		
Assistant staff	10,5					

4.42 Temporary personnel of the Municipality employed in the sports facilities

Tab. 12: Temporary personnel of the Municipality

Temporary personnel of the Municipality employed in the sports facilities						
Specialization	Number of Persons / Percentages					
	0	1	2-3	4-6	7-10	10+
Administrative staff	10,3	1,4				
Physical Education & Sport Science Instructor	10,3	1,4				
Plumber	10,3	1,4				
Electrician	5,9	4,4		1,4		
Maintenance technician	11,8					
Fire safety technician	11,8					
Safety technician	11,7	1,4				
Occupational Safety Officer	11,8					
Cleaning staff	5,8	22	1,5	1,5		
General duties staff	8,8	20,5	2,9			
Assistant staff	8,8	2,9	1,5			

4.43 Employment relationship and specialization of staff (salaried/other employment relationship)

Tab. 13: Employment relationship and specialization of staff

Employment relationship and form of employment of staff (salaried/other employment relationship)						
Specialization	Number of Persons / Percentages					
	0	1	2-3	4-6	7-10	10+
Regular staff (permanent / indefinite time)	10,3	45,5	5,9	5,9		
Fixed-term contract (duration of contract)	2,9	16,2				
Project contract (duration of contract)	8,8	1,5				
There are contracts with private partners/individuals for specific services	10,3	1,5	2,9			
Operating and maintenance costs are taken over by the clubs using the facility	11,8					

4.44 Access management

Tab. 14: Accessibility for people with disabilities and people with access problems

Access management	%
Mobility requiring the use of an automatic wheelchair or scooter	52,6
Mobility requiring the use of a manual wheelchair	92,1
Mobility requiring the use of other mobility aids	42,1
Mobility - no assistance required but there is a limitation of mobility, e.g. ability to cover a limited distance	39,5
Blind or partially blind	39,5
Deaf or hard of hearing	39,5
Cognitive difficulty related to speech, comprehension or learning	39,5
Other disabilities	15,8

4.45 Accessibility attributes

The following table shows the accessibility attributes that exist or not at the sports facilities.

Tab. 15: Accessibility attributes

Accessibility attributes	%	
	Yes	No
Designative accessible parking spaces	45,6	14,7
Existence of a ramp near the parking spaces for the people with disabilities	10,3	45,6
An intercom at an accessible height at the entrance/reception		51,4
Entrance that offers independent access (automatic doors)		52,9
Clear signage indicating accessible areas/features	13,2	39,7
Alternative format guest information (text, Braille, audio tape etc.)	4,4	45,5
Continuous accessible path to all shared spaces (rooms, hall, gym, swimming pool, etc.)	20,5	30,9
Handrails throughout facility	7,3	44,1
Seats near the lift for the stands	1,5	51,4
Specially designed wheelchair spaces at the stands in a safe place	4,4	41,7
Specially designed wheelchair spaces near the pitch in a safe place	8,8	38,2
Accessible areas for athletes' services	41,2	16,2
Easily operated door handles (e.g. D-handles)	7,4	47
Switches and door handles located 900-1100mm above floor level	25	27,9
Clear circulation and manoeuvring space between walls and other equipment at the facility	13,2	39,7
Access to a telephone typewriter (TTY)	13,2	42,7
Internet and/or email access	13,2	38,2
Men's / women's changing rooms for people with disabilities (at least one)	11,8	42,6
Bathroom/WC door that opens outward	23,5	32,4
Non-slip bathroom floor	4,4	47
Call/emergency button in the bathroom/WC		47
Grab rails in the bathroom/WC (800-810mm)	4	47
Roll in hobless shower entry (no raised edge)	8,8	41,2
Pull-down bench in shower	3	44,1
Handheld shower head with a long hose (2 metres)	2,9	45,5
Lever action mixing water taps	1,5	47
Toilet seat between (460-480mm) in height from the floor	5,9	44,2
Clear circulation space between the toilet and the walls/door to allow for transfer	10,3	38,2
Emergency evacuation orientation	5,9	41,2
Illuminated switches	8,8	36,8
Well-lit public areas	14,7	29,4
Emergency phone in lift	1,5	47
Easy push floor surface (tiles, etc.)	7,3	41,7
Pool with access provisions	5,9	45,6
Gym with access provision	5,9	42,6
Trained fitness instructors in helping individuals with disabilities to participate at sports/recreation programs	4,4	42,6
Facility with accessible sauna, jacuzzi or hot tub	2,9	47
Trained personnel in helping individuals with disabilities	4,4	45,5
Professional support and training in the facility	2,9	47
Suitable sports equipment for people with disabilities is provided	4,4	47,1
Sports/recreation programs that allow persons with disabilities to participate	5,9	45,5

4.46 Actions taken for the evacuation of sports facilities

At the question concerning the actions taken to evacuate sports facilities, the table shows the percentages of responses.

Tab. 16: Evacuation actions

Actions taken for the evacuation of sports facilities	%
Escape and evacuation plans	14
Escape and evacuation plans posted in visible places	9,3
Clear responsibilities of all employees (who does what, when, how)	7
Staff training	81,4
Sound system for crisis information	9,3
Mobile android/ios application	2,3

4.47 Providing first aid

Tab. 17: Providing first aid

Providing first aid	%
Pharmacies in visible and accessible place	47,6
Disinfection programme for sports facilities, changing rooms and toilets	45,2
AED/CPR Rescue Kit	40,5
First aid training for staff	38,1
Oxygen bottle	33,3
Medical support staff	7,1
Medical and first aid procedures	7,1
Doctor	2,4
Written instructions posted in visible places on what to do in the event of an accident	2,4
Written appointment of a person responsible for medical matters	0

4.48 Formation and development of a stable network with stakeholders, in order to support, promote, manage and operate more efficiently

When asked whether a stable network of entities has been formed and developed to support, promote, manage and operate more efficiently (e.g. associations, federations, educational institutions, etc.), 40.5% answered positively, 37.8% said they did not know and 21.6% answered negatively.

4.49 Donations/sponsorships

When asked if there are donations/sponsorships to support the operation of the facility, 61.5% responded that they did not know and 38.5% responded that there were none.

5. Discussion

The results of the survey showed that the majority of municipalities have privately owned sports facilities. This gives them the flexibility to use their facilities more easily, as: a) their decisions do not involve other bodies, b) there is not much time between the decision and its implementation, and c) the cost of implementing decisions is minimized, as no additional documents and the mediation of legal services are needed. While privately owned sports facilities can offer some benefits, it is important for local authorities to ensure that these facilities are accessible to all members of the community, regardless of their socio-economic status or ability level. To achieve this, local authorities can consider the following actions:

- Establish partnerships with private facility owners to ensure that they are meeting the needs and interests of the community, and to negotiate fair pricing and usage policies that reflect the public interest.
- Develop a system for monitoring and regulating privately owned sports facilities to ensure that they are meeting basic health, safety, and accessibility standards, and to address any complaints or issues that may arise.
- Prioritize the development and maintenance of publicly owned sports facilities that are designed to serve the diverse needs and interests of the community, and that are accessible to all citizens.
- Engage with citizens and stakeholders to gather feedback and input on the availability and quality of sports facilities, and to identify areas where additional investments or improvements may be needed.

By taking a balanced and strategic approach to the ownership and management of sports facilities, local authorities can ensure that their communities have access to high-quality and inclusive sports opportunities that promote health, well-being, and social connection. It is true that the supervision of sports facilities by a deputy mayor may be influenced by their personality or

political beliefs, which can create a risk of improper exercise of supervision. To minimize this risk, it is important to establish clear guidelines and procedures for the management and oversight of sports facilities, and to ensure that these guidelines and procedures are followed consistently and transparently (Hallmann, Kaplanidou, Breuer, 2010).

A structured hierarchical organization can be beneficial in ensuring that decisions are made and actions are taken in a controlled and accountable manner. This allows for effective oversight and monitoring of the management of sports facilities and provides a means of identifying and addressing any malfunctions or deficiencies that may arise (Karastathis, Yfantidou, Kormikiari, Gargalianos, & Kalafatzi, 2021). Ultimately, the effective supervision of sports facilities requires a commitment to ensuring that the best interests of the community are served, and that resources are managed in a responsible and accountable manner. This requires a combination of effective leadership, clear guidelines and procedures, and a culture of accountability and transparency.

It is concerning that a small percentage of respondents in the survey were not aware of the existence of operating regulations or rules governing the operation of sports facilities. This suggests that there may be a lack of communication and training among municipal officials responsible for managing these facilities. It is important to ensure that all relevant stakeholders are aware of the regulations and rules governing the operation of sports facilities, and that appropriate training and education is provided to staff to ensure that they are able to implement these regulations effectively. While it is positive that most sports facilities already have operating regulations in place, it is important to ensure that these regulations are complete and comprehensive. In particular, the absence of procedures for dealing with injuries and emergency situations is concerning, as these are critical aspects of managing sports facilities. It is important to review and update regulations regularly to ensure that they remain relevant and effective in addressing the needs of users and ensuring the safety of all involved.

In summary, while the existence of regulations governing the operation of sports facilities is a positive step, there is a need for greater awareness, training, and education among municipal officials to ensure that these regulations are implemented effectively. Additionally, regulations should be comprehensive and regularly reviewed and updated to address the evolving needs and challenges of managing sports facilities.

As far as the range of facilities based on the specifications of each sport, the survey showed that, almost in absolute majority, their potential is exhausted at the local level. On the one hand, this fact shows that the facilities are used by the citizens of the municipality concerned, but on the other hand it reveals an introversion of the municipalities, as both at regional and wider level, the low rates of hosting sporting activities prove that there is a lack of cooperation. Perhaps adopting a more outward-looking attitude to develop new partnerships would improve the utilization of facilities. For example, the use of the facilities as training facilities could bring multiple benefits to the municipalities, including stimulating the economy of the area concerned.

Regarding the registration on the platform “Pelopas”, all the Municipalities have participated universally. It is noteworthy that all respondents replied that they recognize the benefits of registering sports facilities. However, the fact that only half of the respondents have answered only the mandatory fields of the registrations, and that the officials responsible for completing the questionnaire did not have all the data at their disposal, as shown by almost all the responses, demonstrates the need for communication and cooperation from all departments of the municipalities, both horizontally and vertically (Bull & Lovell, 2007).

At the same time, the survey revealed that the types of sports facilities in each municipality are limited. The majority are football pitches, while swimming pools are a few. However, the short distances between the municipalities in the Region enable easy movement of participants and the adequate development of sports at local and regional level. This fact could be exploited to increase the organization of sporting events which, as the research has shown, while there is a will, there is no corresponding support in terms of technical, financial and human resources.

With regard to the general operating systems used, the main energy sources are electricity and natural gas. Also, for the electrification of the installations, almost all the installations use outdated

technology, electrification with halogen lamps, as opposed to the more modern and certainly more economical, electrification with LED lamps. The latest developments worldwide at political and economic level have had a negative impact on fuel prices and it is considered necessary to adopt alternative and sustainable forms of energy in order to ensure the sustainability of sports facilities.

In the question on whether fire protection is in place, only two thirds answered that it is covered, and similarly, as regards the variable on anti-theft protection, only half of the respondents stated that they have an alarm system. Here again, the lack of communication between the staff of the different departments is evident, as for both of the above variables the percentage that stated that they did not know reaches one third of the total.

Regarding access to sports facilities, the survey showed that athletes mainly travel by car, followed by those who do not use any means of transport, while the percentage of those who can reach the facilities by public transport is significantly lower. The non-availability of a nearby airport and port for the majority of facilities and the lack of a train approach to the region of EMT makes it difficult to choose the region for the implementation of sporting events and are issues that need to be addressed at a higher level.

Regarding the questions on the staffing of the sports facilities of the municipalities with personnel either with permanent employment or as temporary staff, the survey showed that there are significant shortages in all sports facilities. Understaffing is a result of the economic crisis in general and carries the risk of sports facilities either under- or under-performing with a multitude of adverse consequences, such as an increase in accidents, poor maintenance of the area, increased looting and damage to buildings and equipment, etc.

The survey showed that about half of the sports facilities of the municipalities have provision for parking and accessible service areas for athletes. The survey also showed that there are particularly low rates (less than 10%) with regard to continuous accessibility of the facilities, specially designed toilets, changing rooms and showers, lighting, special equipment and, of course, qualified and properly trained staff. The survey showed the need to give importance to the accessibility part, to have support from the state in order to ensure that sports facilities are used equally by all citizens of the municipality concerned. It might be useful for municipalities to seek funding through European programmes that promote equal treatment actions in order to improve accessibility to sports facilities (Yfantidou et al., 2018; Van den Berg, Braun & Otgaar, 2000).

It is concerning that sports facilities rely primarily on staff training for response and risk management, and have inadequate escape and evacuation plans. It is essential to have well-designed and practiced evacuation plans to ensure the safety of all individuals in case of an emergency. Additionally, having trained staff in first aid, including doctors and nurses, is crucial for providing immediate medical attention in case of injury or other health-related issues. The lack of necessary equipment, such as defibrillators and pharmacies, also poses a significant risk to the safety of sports facility users.

It is commendable that some facilities have staff trained in first aid, but it is imperative that all facilities have adequate resources and trained personnel to address any health emergencies that may arise. The safety of sports facility users should be a top priority, and any shortcomings must be identified and addressed promptly to ensure the safety of all individuals (Cocking, Drury & Reicher, 2009).

Overall, it is crucial for sports facilities to have comprehensive risk management plans that cover all aspects of safety, including evacuation plans, first aid, and necessary equipment. By prioritizing the safety of their users, sports facilities can ensure that individuals can enjoy sports and recreational activities without fear of harm (Borch, 2013; Drury & Reicher, 2020).

The research findings suggest that there is a need to expand efforts to increase extroversion and develop communication between municipalities, associations, federations, and educational institutions in order to create a stable network that can support, promote, manage, and operate more efficiently. The low percentage of respondents who have developed a communication network with similar bodies indicates that there is a significant room for improvement in this area.

Events and joint actions between municipalities can be effective means to develop communication and establish stable relationships that promote partnerships and contribute to extroversion. By organizing and participating in such events, municipalities can expand their networks and create opportunities for collaboration and knowledge sharing. These events can also provide a platform for discussing common challenges and finding solutions to address them.

Developing partnerships and networks between municipalities can lead to several benefits, including improved coordination and resource sharing, increased efficiency in service delivery, and the ability to tackle complex problems through joint efforts. By working together, municipalities can also increase their visibility and attract investment and support from external partners.

In conclusion, the findings of the research highlight the importance of expanding efforts to develop communication and partnerships between municipalities and similar bodies. Events and joint actions can be effective means to achieve this goal and create stable networks that can support, promote, manage, and operate more efficiently. By investing in these efforts, municipalities can benefit from increased coordination, efficiency, and visibility, which can lead to improved service delivery and better outcomes for their communities (<http://www.tafisa.de>; <http://www.iwbf.org>; <http://www.isca-web.org>; https://ec.europa.eu/programmes/erasmus-plus/about_el).

5.1 Contemporary threats and problems

Like any organization, sports facilities are directly affected by both their internal and external environment. The most important areas that constitute the environment of sports facilities are related to the economy, the legal framework, the demographic factor, technology, politics, climate change, the pandemic we are currently experiencing and international developments in the energy sector.

The economic downturn of recent years caused by the global financial crisis, the decline in the purchasing power of citizens and changes in consumer preferences have had a significant impact on the operation of all organizations and, by extension, sports organizations, particularly non-profit organizations, which are finding it difficult to raise funds. Increases in the prices of goods and services and the high level of unemployment have a negative impact on the consumption of goods and services (Alexandris, Kenanidis, Balaska & Ntovoli, 2020).

The operation of sports organizations may be affected by changes that may occur in the legislative framework of the country, the tax framework, the rules governing the safety and health of citizens, the laws governing labor relations. The operation of sports organizations may also be affected by the demographic factor relating to the population of the area concerned. For example, the increase/decrease in the number of unemployed people, families with one income, senior citizens, births taking place in the area, ethnic diversity, are factors that can have a significant impact at the local level and need to be taken into account as they determine the proportion and type of activities that can be developed in the area.

In the last 50 years technology has been developing rapidly and is an exogenous factor that puts pressure on all organizations. Technology has penetrated all areas of human activity and has progressively penetrated sport. Despite its positive impact on all areas of our lives, it also has negative implications for fitness and participation in sport, as it encourages sedentary lifestyles and physical inactivity.

The role of the state in the development of local authorities and, by extension, in the sports participation of citizens is very special and of great importance. Experience shows that development issues are very much influenced by the relationship between the state and the local authorities. In the past, local government was more partisan, which stood in the way of developing partnerships with the state in order to achieve the required objectives. Partisan entrenchment hinders progress in all areas, as it usually serves only small political interests and is indifferent to the common good. Getting rid of these orientations and making the people who run the local authorities care for the citizens leads to development and prosperity (Alexandris, Girginov & Scheerder 2023).

The climate change that has affected the planet in recent decades, the greenhouse effect, high temperatures and extreme weather events have a significant impact on sport (Laing & Frost, 2010). These phenomena pose a threat to the organization of sporting events and, by extension, to the profits they generate for sports organizations or the sustainability of municipal sports facilities. The IOC has included environmental issues on its agenda and in 2005 published a specific code on how to organize and conduct the Olympic Games, taking into account environmental issues. Specifically, it addresses parameters relating to facilities, accommodation for athletes and spectators, transport, nutrition for athletes, hygiene conditions in Olympic venues, waste management, energy, etc. Organizations involved in sport must set themselves the objective of improving their sustainability strategy in order to cope with the damage that occurs in sports venues due to extreme temperatures and prolonged periods of drought or flooding. Climate change is an urgent and vital issue, which must be taken seriously both for the health of athletes and spectators at sporting events and for the ability of sports organizations to continue operating in sustainable conditions. Municipalities must make the necessary arrangements to improve their infrastructure and make it as resilient as possible (Yfantidou & Matarazzo, 2017). The use of retractable roof systems, improving the capacity of pitches to absorb water and channel it out of the site, and the development and dissemination of aerodynamic structures that reduce the wind intensity to which athletes and visitors to sports facilities are exposed can help to minimize the impact of extreme weather events (Girginov & Preuss, 2021).

The pandemic lockdown still today has an impact on all areas of our daily lives, as it has negatively affected both the physical and mental health and well-being of people around the world. The strict protocols to reduce the spread of the virus have also affected local communities, which have suspended many sporting activities and cultural events that used to attract tourists. It is important to stress the risk that small-scale events and indoor sports are at risk if they are not adapted to the new conditions by adopting the appropriate measures proposed by the competent bodies.

High energy costs are now a threat to sport in Europe and, by extension, in our country. Saving energy, energy consumption and the production of clean energy should be the main concern of everyone and especially of the state. Environmentally friendly construction and renewable sources should be feasible options. Unfortunately, however, they are long-term processes and the state has not yet made the necessary investments to implement them in the near future. Many sports facilities, particularly swimming pools, which consume much more energy, especially in winter, are called upon to deal with emergency situations that even put their very operation at great risk.

6. Conclusions

In Greece not enough measures have been taken specifically for sport. There are some moves at central level, such as subsidies for electricity, gas and car fuel, but these are not enough to cover the needs. A reduction in fuel tax and additional subsidies can make an important contribution to overcoming the energy crisis as painlessly as possible. The main concern of the Ministry of Sport should be to create sustainable sports facilities and to provide the necessary funding to ensure that all sports facilities achieve energy class A.

Factors that hinder development, do not eliminate the bad texts of the area and hinder the implementation of new ideas and proposals that promote the sporting idea are the lack of a methodologically integrated strategic development planning, the poor management of human resources and the sporting policy that is not based on scientific training. The main concern of those responsible should be the human resources that staff the relevant municipal departments. Particular attention should be paid to the recruitment of experienced and trained staff, especially those who will be involved in activities involving children, as incidents of harassment and violence against both children and vulnerable social groups have recently come to light. Selecting the right people, as well as their ongoing assessment by experts, reduces the chances of pathologies and extreme

behaviors occurring against the athletes and provides safety in the facilities under the jurisdiction of the Municipality.

In conclusion, the need to create the right conditions in the economic and organizational sector should be stressed, so that sport at all levels can follow the path of success, progress and social contribution. The state, through the competent entities, must stand by the country's sporting policy. The effort to improve the logistical infrastructure, the reduction of bureaucracy and freedom from petty political interests, will lead to the utilization of all the productive factors of sport and their maximum efficiency through the programmes implemented and with the appropriate support from both the state and private initiative.

The recording of the sports facilities of the local government gives the opportunity to identify their shortcomings and weaknesses and changes can be planned that will contribute to the sporting development of municipalities, for the benefit of society. Their maintenance, upgrading and modernization should be a priority. The goal of sports development is controlled change, which leads to improved efficiency. Knowing their potential in terms of sports facilities, Municipalities will be able to claim and implement Sport for All Programmes, to join Public Investment Programmes for the improvement of sports facilities, to claim participation in Partnership Agreement (PA) 2014-2020 funded programmes for the further development of sports facilities and energy saving in accordance with international standards, but also to obtain the special license granted by the GSS for the 106organization of sports and cultural events, enhancing the quality of the sports facilities and the quality of the environment.

Through the development of sport by the utilization of sports facilities, the Municipalities of Ester Macedonia and Thrace will also contribute to the improvement of social conditions, as the possibility of sport is a privilege for all, far from discrimination and social exclusion, giving space to both the disabled and special population categories. Sports facilities will be made more user-friendly, with a focus on youth development programmes, and more development opportunities will be provided for sports clubs.

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Why are born-digital retailers expanding offline?

GIULIA CASAGRANDE* BIRGIT HAGEN*

Abstract

Framing of the research. *The retail industry is undergoing a major shift with the rise of digital channels and the decline of traditional brick-and-mortar dominance. However, some digital-born retailers are expanding their business offline, presenting a new phenomenon that is worth exploring.*

Purpose of the paper. *This study aims to understand the reasons behind the decision of expanding offline and its impact on both the customer journey and business model.*

Methodology. *The study utilizes a multi-case study approach, incorporating primary and secondary qualitative data to provide a comprehensive and nuanced understanding of the subject matter.*

Results. *The findings reveal that companies expand offline for three main reasons: marketing, targeting new customer segments or markets, and taking advantage of cross-channel synergies. The customer journey is impacted mainly in the early phase when customers search for information about the brand and products, as they appreciate the opportunity to interact with products, engage with people face-to-face, and have a positive experience. The study also confirms that expanding offline can impact the business model, particularly in terms of customer relationships, targeted customer segments, and partnerships.*

Research limitations. *It is worth noting that the study has some limitations, including a small sample size and the selection of companies that only sell deep products.*

Managerial implications. *The research offers valuable insights into the motivations behind digital companies expanding offline, providing a comprehensive framework for understanding the subject matter. The findings have practical implications for digital retailers considering physical expansion and offer valuable insights into the factors they should consider before making such a decision.*

Originality of the paper. *This study offers a fresh perspective on the existing literature by integrating a dual examination of both the company's business model and customer journey. It provides a unique contribution to the field of retailing and offers valuable insights for digital retailers contemplating physical expansion.*

Key words: *born digital; retail; customer centricity; business model; cross-channel; brick-and-mortar*

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1. Introduction

The retail industry has been in a state of flux for several years now, as the rise of online shopping and changing consumer habits have led to the increase of e-commerce. The Covid-19 pandemic has only accelerated this trend, causing many consumers to purchase online (OECD, 2020). This, together with the laws to address the pandemic that forced the closure of many physical stores, has led some journalists to refer to the current situation as the “retail apocalypse” (e.g. Foroohar, 2020). However, the data reveal a different picture: most retail sales are still made offline (Coppola, 2021) and the number of retail physical stores in the US remained stable over the last years (Smith, 2020), so there is no trace of a collapse in the number of physical stores. Nevertheless, it is undeniable that the e-commerce industry is experiencing a steep increase and that many former physical-only stores have expanded online.

Nowadays, the online-offline realities coexist, and a growing number of retailers interact with their customers through different channels. In fact, also digital-born companies are opening physical channels. While there is extensive research on traditional retailers expanding online, the opposite phenomenon is less explored: why are digital companies opening physical channels?

The study examines why born-digital retailers expand offline. The objective is to increase understanding in:

- Why did former pure digital retailers decide to open physical channels?
- How is the customer journey affected by these new channels?
- How other parts of the business model are affected by these new channels?

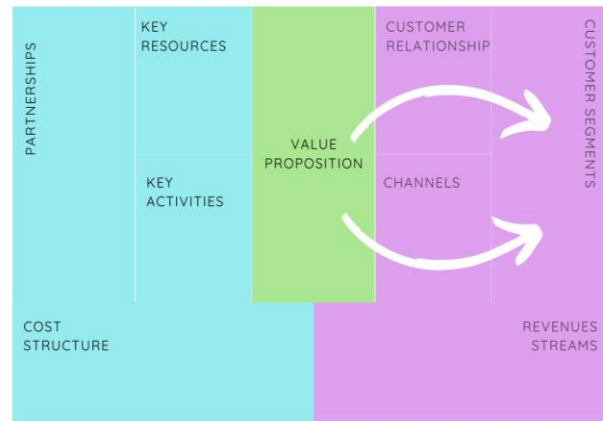
Findings provide valuable insights into the motivations and strategies behind the decision of digital-only companies to expand offline and the impact of these physical channels on customer journeys and business models. The research makes several contributions in the field of retailing by providing a comprehensive framework for understanding the motivations behind digital companies expanding offline, and presents a fresh viewpoint to the existing literature by integrating a dual examination of both the company’s business model (BM) and the customer journey (CJ).

2. Theoretical Framework

2.1 Business Model

A business model (BM) is a tool that helps the company’s managers to understand how the firm is able to create value and deliver it to its customers (Sinfield *et al.*, 2011), and what are the most effective mechanisms to capture part of it through its operations (Teece, 2010). For this article’s purpose, the analysis of the BM is useful to understand how the physical channels can help digital companies to increase their competitive advantage through redesign, substitution, or elimination of certain elements of the BM (Jocovski *et al.*, 2019). The Business Model Canvas is a tool that can be helpful to summarize and visualize these systemic changes. The framework (Figure 1) is based on Osterwalder and Pigneur (2010) work. The elements on the right (partnerships, key resources, and key activities) represent all the elements that can be modified to improve efficiency while the elements on the left (customer relationship, channels and customer segments) represent the elements that can be optimized to increase the company value.

Fig. 1: Business Model Canvas



Source: adapted from Osterwalder and Pigneur, 2010

Through the addition of an offline channel, the firm can potentially target all the customers that do not use digital channels due to various reasons such as privacy and security concerns (Inman and Nikolova, 2017; Nam and Kannan, 2020), technology avoidance (Vakulenko *et al.*, 2019) or simple preference for offline channels (Husemann and Eckhardt, 2018). These customers can be a large source of revenue for the company and the opening of an offline channel can be a great opportunity for companies to increase brand awareness and discover new customer segments. Regarding the relationship with customers, offline channels open the possibility to create a tangible and concrete multisensory experience (Zhang, Chang and Neslin, 2021), and providing customers with information impossible to gather online (Cai and Lo, 2020; Gauri *et al.*, 2020; Zhang, Chang and Neslin, 2021). This could lead to an increase in customer satisfaction, thanks to the direct contact with a salesperson (Gauri *et al.*, 2020; Brown *et al.*, 2014) and the shop ambience (Betancourt *et al.*, 2016). The company can take advantage of it also in the long term since this face-to-face relationship can help in connecting with customers emotionally (Zhang, Chang and Neslin, 2021), and build long-lasting relationships (Palmatier *et al.*, 2006), useful to retain customers. Opening a physical channel can also impact the cost structure and the efficiency of the company. In fact, physical assets usually require more investment compared to online channels (Brynjolfsson *et al.*, 2009; Gauri *et al.*, 2020). On the other hand, partnerships can increase efficiency because, with the small financial risk, they allow the organization to reach a wider audience. The impact of a new physical channel on a company's key resources and activities varies based on the type of channel and integration decisions. A partnership-based approach will not likely impact key resources and activities while opening multiple stores or integrating technology can have a significant impact. For instance, an in-store initiative that helps customers to order online items non-available in-store can represent a key resource for the company in order to avoid market share reduction (Jocovski *et al.*, 2019).

Concerning the value proposition section, some scholars argue that channels vary in the value they offer customers (e.g. Grewal *et al.*, 2004). However, others argue that channels do not differ. This view sustains that, when fully integrated, channels should be able to deliver the value proposition from any channel in the same way. In support of this hypothesis comes the BMC, which defines channels as all the managed ways that a company uses to reach its customers to deliver its value proposition (Osterwalder and Pigneur, 2010). This statement is important as it suggests that businesses can prioritize their efforts towards establishing a robust value proposition, regardless of the channel employed.

2.2 Channels

As per BMC, the channel element is responsible for delivering the value proposition to the targeted customer segments. A company's chosen channels serve several critical functions in terms

of interacting with and delivering value to customers: in the information search stage of the CJ, channels help customers learn about a company and its offerings; provide information and assistance that helps customers compare different companies' products and value propositions; in the purchase stage, they enable customers to select and acquire the desired product or service; in the acquisition stage, they deliver the value proposition to customers; and finally, in the post-purchase and return stage, they provide customer support in case any problems arise.

Channels can be classified by their objective:

- Communication channels: used to reach and engage the target audience, raising awareness and building interest. Thanks to two-way communication promoted by web 2.0, they are now also an important way to collect data.
- Distribution channels: are responsible for delivering the product or service
- Sales channels: used to close the transaction with the customer.

Sometimes one channel can serve more than one purpose, for example, a website can be used as a communication, sales and transaction channel.

Channels can also be classified according to ownership:

- Owned channels are those that are owned or operated by the company, such as company-owned retail stores or in-house sales. They can be more expensive to set up and run but could lead to higher profits compared to non-owned channels (Osterwalder and Pigneur, 2010), and they give the company control over the products and brand presentation.
- Non-owned channels involve a partnership with another organization and can include options such as retail stores, marketplaces, wholesale, or partner-owned websites. Partnerships are convenient because companies can enter a market with an established customer base, they can take advantage of the partner's existing knowledge, and use an existing distribution network.

Channels can be categorized also considering the means chosen by the customers to interact with the company. In the most recent literature, channels are categorized into three macro categories: web-based channels, mobile channels and offline channels (Brynjolfsson *et al.*, 2013). This study categorizes the web-based and mobile channels into the category "online channels" and the physical channels into the category "offline channels". The following table illustrates and compares the advantages of online and offline channels (Table 1).

Tab. 1: Comparison of offline and online channels

offline		online	
advantage	source	advantage	source
customer point of view			
tangible, concrete, multisensory experience	(Zhang, Chang and Neslin, 2021)	wide assortment	(Cai and Lo, 2020; Brynjolfsson, Hu and Rahman, 2009; Gauri <i>et al.</i> , 2020)
possibility of product inspection	(Cai and Lo, 2020; Gauri <i>et al.</i> , 2020; Zhang, Chang and Neslin, 2021)	better pricing	(Cai and Lo, 2020)
instant gratification and high delivery speed	(Cai and Lo, 2020; Gauri <i>et al.</i> , 2020)	availability of reviews	(Cai and Lo, 2020)
direct contact with salesperson	(Gauri <i>et al.</i> , 2020)	accessible information on digital attributes	(Lal and Sarvary, 1999; Gauri <i>et al.</i> , 2020)
sense of reliability and trust	(Brown <i>et al.</i> , 2014)	quick comparison of products' prices and features	(Cai and Lo, 2020)
ambience	(Betancourt <i>et al.</i> , 2016)	easy access and ubiquity	(Brynjolfsson <i>et al.</i> , 2009; Gauri <i>et al.</i> , 2020)
immersive brand experience	(Gauri <i>et al.</i> , 2020)	tailored experience	(Marr, 2017; Piccoli and Pigni, 2019)
less privacy and security concern	(Nam and Kannan, 2020)		
intensifying customer engagement	(Palmatier <i>et al.</i> , 2006)		
company point of view			
effective in building emotional connection with customers	(Steinhoff <i>et al.</i> , 2018; Zhang, Chang and Neslin, 2021)	more consumers data available	(Marr, 2017; Piccoli and Pigni, 2019; Bilgic and Duan, 2019)
best for long-lasting customer-firm relationships	(Palmatier <i>et al.</i> , 2006)	market scope is unlimited geographically	(Brynjolfsson <i>et al.</i> , 2009)
		lower establishment and location costs	(Brynjolfsson <i>et al.</i> , 2009; Gauri <i>et al.</i> , 2020)

Source: our elaboration

2.3 Customer Centricity and Customer Journey Perspective

Starting from the view that the company's success depends on the perceived value that customers place on its products and services, we take the customer's point of view into consideration. The objective of the customer-focused firm is to maximize revenues by effectively satisfying customers' needs and maintaining customer loyalty (Shainesh and Gaurav, 2017), as retaining customers is less expensive than finding new ones. A big challenge lies in the intrinsic mutability and uncertainty of the relationship with customers: potentially they continuously change their perceptions about a brand or a company, according to the positive or negative discrepancies between their expectations and their perceptions. Thus, the creation or disruption of value can happen at any time during the CJ, at any touchpoint, and thus, through different channels (Følstad and Kvale, 2018). Value creation (or destruction) influences intangible assets, e.g. the brand reputation, but can also have an impact on market share and profitability (Gentile, Spiller and Noci, 2007).

The customer journey (CJ) is often described as a linear process divided into stages. This is a simplified view of more complex processes, often characterized by nonlinear patterns and involving multiple actors. However, it is a useful way for mapping and analysing the processes, as well as having an easy overview of them (Følstad and Kvale, 2018). Lemon and Verhoef (2016) described CJ as a process in three phases: information search phase, purchase, and post-purchase. The purchase phase then could be further divided into the purchasing and the acquisition phase (Gauri *et al.*, 2020), especially in digital CJs. In the information search phase, customers become aware of a need and then seek information about potential products or services that can satisfy this need. During the purchase phase, customers narrow down their options and make a final decision. Finally, in the post-purchase phase, customers use and evaluate the product or service. If they are satisfied, they may become loyal customers and advocates; if not, they may request refunds, customer service or return the products. The customer experience is the result of all the feelings, perceptions, and considerations that customers are exposed to during this process (Lemon and Verhoef, 2016).

For every phase of the CJ the customer has the possibility to choose between different channels (Neslin and Shankar, 2009). This linear representation is useful to imagine an ideal CJ but it does not express the possible cross-channel experience that the consumer might go through in the same phase. This cross-channel experience can smooth obstacles by removing impediments (or instead establishing barriers) that might spoil the customer-firm relationship (Gauri *et al.*, 2020). The customers have an active role and they can co-create their own tailored experience (Herhausen *et al.*, 2019).

3. Literature Review - Reasons to Open Physical Channels

3.1 Customer Experience

One of the reasons digital companies decide to establish physical channels is to improve the quality of customers' experiences through concrete, tangible and multisensory engagement (Gauri *et al.*, 2020; Zhang, Chang, and Neslin, 2021). Physical channels are particularly important to reduce the obstacles customers may face during the first phase of the CJ, the information search phase. This phase is characterized by the search costs, which can be defined as the effort that the customer has to make to find relevant information about products or services (Gauri *et al.*, 2020). The higher the search costs, the less smooth the customer experience. The internet decreased search costs, by providing an easy and quick comparison of different offers in terms of prices and providing non-sensory information about digital attributes (i.e. all the features of a product that can be communicated online) (Gauri *et al.*, 2020). However, on the internet, it is still very difficult to gain information about non-digital attributes, namely all the features that can only be evaluated through physical inspection (Zhang, Chang, and Neslin, 2021). The problem is partially solved thanks to

reviews, but these are too subjective and their reliability can be low as many reviews are fake or biased, making it difficult for consumers to trust the information provided (Woollacott, 2022).

Moreover, the five senses are critical in the information search phase (Zomerdijk and Voss, 2010), especially to collect certain information that can be evaluated only physically. This raises the topic of the strong connection between channels and the type of products (Neslin *et al.*, 2014): consumers decide what channel to use also based on the product they need to purchase. For example, when purchasing cosmetics, consumers might want to evaluate the texture, smell the perfume and receive tailored advice from a salesperson. The products that require a deep inspection, often physical and tactile, are called “deep products” (Zhang, Chang, and Neslin, 2021). Based on the fact that information quality drives customer satisfaction (Luceri *et al.*, 2022) and that customers select the channels that provide them with a better-perceived value and enable them to attain their goals (Hosseini *et al.*, 2018), it seems clear that consumers would prefer physical channels over digital ones to gain information about deep products. In fact, despite the recent technological advances, nowadays sensory information continues to be of higher quality in a physical context. To remain competitive and allow customers to physically experience the products, digital companies have to offer free returns (Jocevski *et al.*, 2019). According to a survey made by Statista in 2020 more than 50% of e-commerce in North America and Europe already offer free returns (cf Chevalier, 2021). However, customers may perceive the return process as stressful since it requires additional effort and could increase search costs and, from a company point of view, reverse logistics is complicated to manage and the environmental impact is remarkable.

Another option for digital-born companies to overcome search costs is to open a physical location. These physical channels are often designed to provide customers with an enjoyable experience and act as a communication channel for the company, with the objective of providing information to customers. For example, showrooms are used to show the products to potential customers and provide them with information and additional tailored services such as the advice of an expert.

In addition to the role of providers of information, a physical presence can also be used by companies as a marketing tool to build trust for the online shop and increase brand awareness. Based on the try-before-you-buy principle, many online companies decided to open pop-up stores, brick-and-mortars, or flagship stores to raise awareness about their products (Gauri *et al.*, 2020). These shops might be unprofitable, as their primary objective is to provide information, promote the brand, and eventually redirect customers to online stores. The literature supports this idea, as the multisensory engagement provided by a physical context increase the effectiveness of the learning process needed to get information (Krishna, Elder, and Caldara 2010) and can impact customers quality perception (Ackerman, Nocera, and Bargh 2010), enabling customers to make convinced purchase decisions (Peck and Childers, 2003). As a consequence, the need for subsequent store visits is reduced (Lal and Sarvary, 1999) and consumers are more likely to purchase the same products online (Zhang, Chang, and Neslin, 2021). The other phases of the CJ might also be determinants when deciding on offline expansion. When it comes to the physical environment, the acquisition phase and the purchase phase of the CJ are generally not distinct from one another. This immediate gratification can increase customer satisfaction. In addition, immediate delivery provides customers with greater convenience, since delivery times and costs are not an issue (Gauri *et al.*, 2020). Lastly, the after-sales phase of CJ is an opportunity to satisfy and retain customers (Cavalieri *et al.* 2007). Giving customers the possibility to choose between different options can per-se increase customer satisfaction e.g. customers can be satisfied simply because they can choose if receiving online or real-person assistance.

3.2 Target Different Market Segments

Another reason for digital companies to open a physical channel is to target different market segments and increase the customer base. Two market segments might be missed without a physical channel:

- The ‘soon-to-be’ customers i.e. those who know the company but, for a variety of reasons, never purchase its products or services (Kim and Mauborgne, 2015). For digital channels, this might be due to the fact that some customers are not prone to use digital channels: they might find the process uneasy and react negatively to technology interactions (Vakulenko *et al.*, 2019). They might never switch to digital channels or be reluctant to do so, because, regardless of the circumstances or type of transaction, customers want to engage in pleasant shopping experiences (Gentile, Spiller and Noci, 2007). The privacy and security concerns can also influence customers’ purchasing decisions online (Inman and Nikolova, 2017). Lastly, some customers simply look for technology-free shopping experiences (Husemann and Eckhardt, 2018). Thus, with the establishment of a physical presence, a company can expand its customer base and alleviate potential sources of frustration for its customers.
- The ‘unexplored’ customers, meaning people who are in markets distinct from the company’s ones (Kim and Mauborgne, 2015). These are all the potential customers that are not aware of the brand’s existence, but this does not imply that they are not interested in the company’s products. In this case, expanding offline can be an opportunity to increase brand awareness among the general public and potentially discover new customer segments.

3.3 Cross-channel Initiatives to Increase Revenues and Decrease Costs

Mobile devices have had a significant impact on CJs and have made cross-channel experiences much easier (Grewal *et al.*, 2017). By bridging the gap between digital and physical channels, smartphones allow customers to move seamlessly between channels. Strategically managing cross-channel initiatives by integrating channels can help in addressing this new market need (Gallino and Moreno, 2014) and increase revenues. In fact, people that use smartphones while shopping tend to spend more (Google, 2013). However, if not properly managed, they represent a threat for businesses. For instance, webrooming (i.e. the habit of researching products online before buying them in-person), can have negative consequences for digital-only companies. In this scenario, their websites serve merely as sources of information in the first phase of the CJ. This might be one of the reasons that push digital companies to open physical points of contact with their customers and integrate them with their digital channels, to not lose potential customers. Sometimes companies can instead take advantage and promote research-shopper phenomena (defined by Verhoef, Neslin and Vroomen as the practices of using one channel to find information and the other to purchase (2007)). For instance, physical spaces can be used as showrooms to allow customers to physically experience the products to then redirect them to other sales channels (e.g. online channels).

Also in the purchase and acquisition phases of the CJ, cross-channel integration can be useful. For instance, companies that implement the ‘buy-online-pick-up-in-store’ service provides customers with the convenience of ordering online with the advantage of having a physical pick-up point, and the opportunity to physically interact with additional products besides those they purchased through the internet (Zhang, Chang and Neslin, 2021). The integration of channels can also increase the company’s efficiency in delivery time and shipping fees (Gauri *et al.*, 2020). When companies have physical spaces as delivery points, the delivery is quick and customers have the possibility to conveniently choose between different pick-up locations.

Moreover, pick-up points can help in overcoming one of the biggest downsides of digital retailers: returns. Most e-commerce companies have free returns options as part of their value proposition (Jocevski *et al.*, 2019) to overcome the problem of non-digital information unavailable online (Gauri *et al.*, 2020). The returns are, however, extremely costly for the company and reverse logistics is challenging to manage (Ülkü *et al.*, 2013). There are times when it is simply more convenient for companies to discard returned goods (Mull, 2021) and the environmental impact is significant (Velazquez and Chankov, 2019). The physical experience can help the customer to make a more informed purchase decision and decrease overall returns (Wang and Goldfarb, 2017).

To conclude, the introduction of cross-channel initiatives seems to positively impact the profitability of the firm (Cao and Li, 2015) and customer satisfaction. If we only consider online-offline integration, most of the literature has reported positive effects and a low possibility of cannibalization effect. Integration between online and offline channels increases repurchase (Beck

and Rygl, 2015), improve the perceived quality and value of the customer experience, decreases the perceived level of risk and boosts sales in the online channels, while not negatively impacting the physical store sales (Herhausen *et al.*, 2015; Pauwels and Neslin, 2015).

The full integration of channels (also known as the omnichannel business model) is a growing trend among retailers (Cai and Lo, 2020; Grewal *et al.*, 2017) which affects not only the customer experience but also the integration of data analysis and of logistics (Jocevski *et al.*, 2019). In this case, the channels are managed collaboratively rather than in silos, to achieve a common goal and the overall performance of channels is considered, viewing the company as a unique system that works with synergies between channels (Yang *et al.*, 2013). This means that businesses focus on providing a seamless experience for customers, no matter the channels the customer decides to choose to co-create its customized cross-channel journey, and retailers act as physical and digital facilitators of market infrastructure (Brynjolfsson *et al.*, 2013; Verhoef *et al.*, 2015). However, despite the clear benefits, the omnichannel strategy is still challenging to implement due to integration difficulties and the complexity of the reorganization of processes (Cai and Lo, 2020).

3.4 Other Hypothetical Reasons

Opening a physical channel can increase brand value. The location plays a key role: having a physical space in the proximity of other brands that target similar customer segments might increase brand awareness and contribute to increasing the perceived brand value. This is especially true for luxury brands (Arrigo, 2015). Companies might decide to open physical channels also to collect insights from the customers. In such an environment, companies and customers may be able to establish a more strong, honest and trustworthy relationship (Palmatier *et al.*, 2006) and exchange information which can be used to generate new value.

4. Methodology

The research methodology employed in this thesis is qualitative in nature and exploratory in scope. The aim of the study is to expand existing knowledge on the reasons why digital-born companies decide to expand offline and the consequences of this additional channel on the CJ and BM. Through multiple case study research and content analysis, insights are generated abductively from comparing empirical data with pertinent literature.

The case-study method was selected based on the research questions, since it is useful for seeking explanations for questions related to recent phenomena and answering questions such as “how” and “why” these phenomena happen (Yin, 2009). Also, the case study method is proven to be effective for research in organisations and management (Hoon, 2013). The multiple case study method was chosen as the study is exploratory, and this method enables the comparative analysis of results that allows the emergence of patterns and “strong and reliable evidence” (Baxter and Jack, 2008; Gustafsson, 2017), useful to increase the overall understanding of the phenomenon.

Primary data were collected through semi-structured interviews. The format was chosen because it stimulates discussion between interviewees and interviewers and helps to further explore the topics. In fact, on the one hand, open-ended questions can be answered subjectively based on the interviewees’ opinions and thoughts (McIntosh and Morse, 2015). On the other hand, the researcher can expand the research based on the answers received, as long as they remain relevant to the study (McIntosh and Morse, 2015). While the secondary data used for this research are media interviews, public data from companies’ websites, and press releases. The gathering of data from various sources is useful as it integrates information and determines the reliability of the information collected (Carter *et al.*, 2014).

The companies to interview were selected among born-digital retailers that decided to expand offline. The first contact with companies was made through emails and cold messages on LinkedIn. The interviews were conducted online through Google Meets.

The interviews were recorded after the approval of the interviewees. Interview participants agreed to be recorded as long as their identity and role remained anonymous, and the recording was kept confidential. All measures were taken to protect the confidentiality of the information provided by the participants. Only the data necessary for the thesis purposes were stored, following the “data minimization” policy of GDPR rules (European Commission, 2019). Therefore, the names of the companies involved, and the names and roles of interviewees will not be disclosed.

The themes identified - effects between channels with the addition of a physical channel, effects of the additional channel/s on the CJ and the BM- are based on the initial research. The interviews were conducted in Italian and lasted between 30 and 45 minutes. The most important topics discussed were noted during the interviews. Right after the conversation, the interviews were transcribed, and the interviewees’ responses were coded to identify patterns (Saldaña, 2016). For Company C, only secondary data was used, consisting of publicly available video interviews. The table below (Table 2) summarizes the information on the companies analysed.

Tab. 2: Companies

Companies	Industry	Physical Channels (owned)*	Non-owned physical channels	Number of employees source: LinkedIn
Company A	Apparel (male only)	Pop-up (T)	Resellers	2-10
Company B	Marketplace, Apparel	Pop-up (T), Outlet (P)	Drop-off and Pick-up points	10k
Company C	Cosmetics	Pop-up (T), store-on-wheels (T), Flagship (P)	Resellers	11-50

*T = temporary, P=permanent

Source: our elaboration

Content analysis was used to derive insights from the primary and secondary data. Based on standard content analysis, this study focused on analysing what interviewees said rather than how they said it (Elo and Kyngäs, 2008). The interview structure formed a basis for the initial identification of themes during the content analysis process. The interview was focused on three main themes: the reasons why digital companies decided to open physical channels, the impact of these initiatives on the CJ, and the systemic effect on the business model of companies. This, together with the literature review, created a framework for initial coding. However, new themes emerged thanks to the semi-structured format of the interviews that stimulated open discussion. So, part of the themes was identified inductively, revealing unexpected issues.

5. Findings

5.1 Reasons to Open Physical Channels

Commonly mentioned reasons to open a physical channel are linked with marketing and branding. The physical space is used to reinforce the message of the marketing campaigns and to increase brand awareness and brand recognition. Company C underlined the risk of losing the brand identity with the offline expansion, especially regarding the expansion with partnerships and expressed the importance of employee training to lower this risk. The concern of how the brand and products are presented was expressed also by Company A, that used the pop-up to show their reseller partners how they would like the brand to be presented.

The physical customer experience was described by companies as an important marketing tool. The interviews underlined the importance for companies of creating enjoyable and unique customer

experiences, to share in a physical space the brand values with their customers. To attract customers, the companies stated that they provide clients with unique services or events that would not be possible online, apparently to create in customers feelings of fear of missing out. Interestingly, the companies emphasized their willingness to bring together the community created online in order to interact face-to-face with the fan base created online. The physical space is also used to bring offline the relationship built with professional collaborators, employees, partners, and potential partners. As a result, the physical space becomes a landmark for networking and increasing brand awareness among all stakeholders.

Moreover, companies discussed the possibility of reaching geographical markets which had never heard of the brand, aiming to use the physical channels as part of their go-to-market strategy. For their nature, online companies are potentially global in scope (Brynjolfsson *et al.*, 2009), so the physical point of contact with clients can be used as a marketing tool to increase brand awareness in new markets, and eventually redirect customers to the online channels. Often this expansion to new markets exists thanks to strategic partnerships with physical retailers already present in that specific market.

Cross-channel synergies are another reason why digital companies open physical channels. None of the interviewees mentioned the cannibalization effect between channels after the opening of physical channels. On the contrary, the channels created synergies and created positive value for the companies. Some of the synergies were strategically planned and managed: for instance, company B's initiative to place tablets in the store, and personnel trained to help potential customers to make purchases through the App, with the objective of redirecting sales to the online store. On the other hand, other synergies were unexpected and unplanned. For instance, company A noticed an immediate showroom effect, beneficial for sales in e-commerce.

Remarkably, the channels are coherent but not identical. The value of the brand is coherent across all the channels, but the products and initiatives are different. These differences are used to differentiate the channels and to influence customer behaviour, trying to attract customers in a specific channel. For instance, Company A sold a product only in the popup, to attract people visiting the store and Company B decided to not sell anything in the pop-up, using it as a showroom, and redirect all the customers in the e-commerce store.

Although none of the companies have implemented an omnichannel BM with complete customer experience, data and logistics integration, all the companies presented some interesting integration initiatives. For instance, Company C is integrating customers' data across channels through a barcode system similar to the traditional loyalty card, and Company B offers its customers physical pick-up and drop-off points through the establishment of a partnership with parcel shops.

5.2 *Impact on the Customer Journey*

The impact of physical channels on the CJ was perceived differently among the various companies interviewed. About the pop-up initiative, Company B stated that the CJ was not affected, stating that the initiative "did not create a change in digital channels". Interestingly, the representative suggested a vision of a completely digital CJ. Additionally, the representative considered the initiative as "not so extensive" and thus implied that a certain threshold of customer impact must be met for the initiative to have a meaningful effect. Conversely, Company A acknowledged that the CJ was impacted.

However, during the interviews, the company emphasized the importance of customers experiencing products and the willingness to provide a space for product testing, indicating the influence of physical channels, including temporary ones, on the information phase of the CJ. They cited customers that do not trust online channels and need to see the product before buying it, or that need personalized advice and face-to-face interaction before buying. In terms of the purchasing phase, organizations have sought to establish synergies between channels to increase overall sales levels. Regarding the last phase of the CJ, despite the offline expansion, company A registered no change in the number of returns while there is no data available for the other two companies.

5.3 *Impact on the Business Model*

The integration of a physical channel may alter the targeted customer segments and markets, as previously discussed. In line with the literature, creating physical channels was also described by companies as a way to reach out to new customer segments:

- customers who already know the brand but never bought online because of reluctance to use digital channels
- people that never heard about the brand and were not targeted beforehand. For example, Company A sold many items to women in the physical shop, a segment that they never considered.

Interviews indicate that the relationship with clients has also changed. Indeed, physical channels allowed physical and face-to-face interactions that would not be possible online. Company A described a more honest relationship with their customers, enabling them to gather feedback and new data, and Company B expresses the intention to increase trust between the clients and the e-commerce through the physical channel. On the other hand, Company B described the pop-up initiative as too localized to change the relationship with its customer base, implying that a certain threshold of customer impact must be met for the initiative to have a meaningful effect. Company C individualized a specific customer segment that needs a physical type of interaction with the product and a face-to-face relationship thus, the additional channel and the change in the relationship with the client allowed them to target a new customer segment. The data shows that the revenues are impacted as well by the opening of a physical channel. Interestingly, Company C noted that part of the increase in sales were due to synergies between channels.

The efficiency side of the BM is also impacted by the addition of a physical channel. Physical channels were described as costly to establish and operate. However, the part that seems more impacted by the physical channel is the partnership section of the BMC.

One form of partnership is the one with resellers. Company A partnered with them to enter new markets and to increase visibility in the markets where the brand is already known. Once customers gain trust in the brand, the goal is to redirect them to the online channels. For Company C, partnerships with retailers are important to increase brand visibility but also are easier to manage from a logistic point of view. Companies A and C described their selection of resellers as a highly selective decision process. They also underlined the downside of losing part of the control of the brand presentation in exchange for wider visibility. To decrease the risk of losing control, Company C implemented some training programs for employees to present the brand and Company A used the pop-up space to show their reseller partners how they would like to be presented to their customers.

The physical channels also allow the creation of other forms of partnerships. For instance, Company A described some agreements it made to sell other companies products in the popup, in exchange for a commission on sales. Noteworthy, all three companies described the physical space as an ideal place to find new potential partners and create networking opportunities with all the stakeholders. So the partnerships enabled the creation of new channels but also channels enabled new partnerships to be formed.

6. **Theoretical contributions**

Why did digital retailers open physical channels?

Research findings are aligned with much of the extant literature Companies often cite branding, experience, and in-depth relationship building as the reason to open physical channels. In line with the literature, these objectives are achieved through customer-centric initiatives, with the aim to involve customers in pleasant experiences and meet their needs. It was also considered important by

companies to provide clients with the opportunity to touch, feel, and see the products in person. This is also in line with the literature since all the companies analysed are selling deep products. So, it can be stated that one of the reasons why companies open physical channels is to reduce the obstacles that customers might encounter in the first phase of the CJ, enabling them to access sensory information unavailable online (Cai and Lo, 2020; Gauri *et al.*, 2020; Zhang, Chang and Neslin, 2021).

The need for face-to-face interaction is identified by Company C in a specific demographic customer segment. This validates the hypothesis that one reason to go offline is to target new customer segments. From the interviews emerged that companies are trying to target through these channels people that are not aware of the brand or people that do not want to use digital channels for shopping. Therefore, the physical channels are a great way for companies to reach new segments of customers, especially the ones that are reluctant to use digital channels, and increase brand awareness among general audiences. The decision to open a physical channel can overcome the problem of technology readiness, targeting e-commerce enthusiasts and laggard customers simultaneously. Moreover, following the theory, the physical space can reduce barriers and impediments to customer-firm relationships (Gauri *et al.*, 2020). For instance, the Company B popup served as a space to increase trust among skeptical customers that already knew the brand but did not want to purchase online. In this way, also with a temporary initiative, the company can accelerate the process of innovation adoption, through a face-to-face introduction of the digital channel, decreasing the potential customers' doubts and frustration.

Interestingly, from the interview with Company A, it can be concluded that opening physical channels is part of their go-to-market strategy, especially with regard to the Asian market. Therefore, offline channels are used also to target completely new markets. It is interesting to note that although the market scope of digital companies is potentially unlimited geographically, the company prefers to establish partnerships with offline retailers rather than expanding internationally or marketing themselves separately. The company takes advantage of the already established customer base, increases brand awareness in that market, positions its brand by selecting the most appropriate retailers and overcomes the issue of high shipment costs. This go-to-market strategy can produce a cross-channel effect because, with the increase in brand awareness, sales on the website from the Asian market increased as well. This supports the hypothesis that shoppers who buy deep products in physical stores are likely to buy them online as well (Zhang, Chang and Neslin, 2021). Other companies have also described synergies between the channels, and the findings are consistent with the literature. None of the companies interviewed discussed channel cannibalization but rather described positive effects on marketing and profitability from the interactions between online and offline channels (Cao and Li, 2015). For this positive relation, the companies accommodated the showroom effect that the physical channel created because they expect that the sales would have been redirected to the online channel. As a result, in line with the most recent literature, the showroom effect was not perceived as a threat by the companies, but rather as an opportunity (Wang and Goldfarb, 2017).

During interviews, it was also revealed that physical spaces are used by companies for networking. Companies A and C, stressed the importance of bringing the online community and relationship offline, blurring the boundaries between the two worlds. The aim is to develop a strong relationship with customers, validating the idea that offline the relationship with customers can be strengthened (Palmatier *et al.*, 2006), and made more intimate (Steinhoff *et al.*, 2018; Zhang, Chang and Neslin, 2021), and that offline experience increases engagement and authenticity perception (Haenlein *et al.*, 2020). One of the interviewees stated that thanks to face-to-face interactions, the company could collect more valuable feedback from consumers, implying that the reciprocal exchange of information and knowledge offline can be used as a means for the creation of value. Interestingly, all the companies described the physical space not only as a place for meeting customers and potential customers but also for forming new partnerships and strengthening existing ones. Thus, the offline space is used to engage all stakeholders and possibly include new ones, creating a 360° networking environment, a finding which extends current literature. Lastly, a note

about non-owned channels. The reasons for opening this particular category of channels are many: from the lower risk of entering new markets to lower initial investment, as well as a solid customer base since the beginning (e.g. Osterwalder and Pigneur, 2010). A further reason to consider this type of solution is suggested by the findings and is linked to the ease of management of the resellers compared to e-commerce. Since the company's risk in this way is transferred to the partner, the demand uncertainty or volatility is no issue. At the same time, logistics are also easier and more efficient: orders are placed together in fewer places.

How is the Customer Journey affected by the additional channels?

There are different opinions between the companies on the impact of the introduction of a new channel in the CJ. For Company B, the pop-up did not impact the CJ because it was not wide enough and could not affect digital channels immediately. From this perspective, the CJ seems only to be the digital one, probably because the digital channels are the most important for the company from an economical point of view. However, some customers surely have been in contact with the physical channels, even if the initiative was limited in space (one location), time (temporary pop-up) and scope. Furthermore, the same interview provides evidence of impact, for example, when it described the use of human resources to assist customers in making purchases online through the iPads available in-store. Overall, the most impacted phase of the CJ is the information search phase. The companies aimed to reduce the obstacles to the purchasing process and increase trust, by providing customers with physical spaces where to experience the products and know more about the company. The findings are consistent with the literature, especially since all companies interviewed are selling deep products that demand physical inspection before being purchased. However, the purchasing phase was impacted as well, e.g. the use of in-store technology helped in targeting distrustful consumers and there was an increase in sales thanks to cross-channel synergies. About the after-sale phase, the only data available came from company A which stated that returns did not decrease as a result of opening physical stores. In contrast, the literature suggests that opening a physical channel should decrease returns (Wang and Goldfarb, 2017).

How is the Business Model affected by this additional channel?

Offline expansion produced a systemic effect on the BM of the companies, and this is consistent with the literature review. The findings showed that thanks to physical channels, the companies were able to reach new customers, especially those who tend to avoid digital shopping experiences. The relationship with customers also changed, allowing the company to have face-to-face interaction with them, receive more honest feedback, and increase trust. Overall, the study results indicate that the possibility of face-to-face interaction results in the acquisition of new customers, more straightforward communication with clients and strengthened relationships with the born-digital community. The findings are partially supported by the literature. In fact, while there is evidence of the improved relationship between firms and customers offline compared to online, the importance of bringing offline the born-digital community has not been widely discussed in the literature analysed (mentioned by Haenlein *et al.*, 2020).

Another interesting impact on the business model relates to partnerships. In fact, in addition to non-owned physical channels, which due to their nature require partnerships (Osterwalder and Pigneur, 2010), other partnership typologies can arise with the addition of physical channels. The findings describe how physical spaces can also be used for informal networking, to contact potential partners and negotiate deals.

7. Managerial Implications

According to the research, digital companies open physical stores for three main reasons:

- To use them for marketing purposes, as places where to promote the brand through memorable experiences, interact with the products and encourage networking and two-way communication between different stakeholders. It follows that the objectives of these initiatives are not necessarily centred around profitability, but rather around brand awareness and positioning.

- To target new customer segments or new markets. Companies can take advantage of physical spaces to target skeptical customers or customers that simply prefer to gain information or purchase products in a physical space. In the absence of physical channels, these customers would have been absorbed by the competitors, so physical channels can increase the competitiveness of digital companies. From a customer point of view, there is the opportunity to co-create an experience, by choosing among different options. This might increase customer satisfaction and strengthen their relationship with the company. The research also pointed out the role that physical channels play in targeting new markets, especially thanks to non-owned channels. A company can enter a new market by utilizing an existing customer base and the physical space of its partners. According to the research results, the main issues to consider here are the choice of partners and the risk of losing part of brand control.
- To increase sales in both offline and online channels thanks to synergies between channels. The companies can manage and promote these synergies through the integration of channels. The findings indicate an attempt to create a seamless customer experience across channels, especially by bringing online communities offline.

The study also confirms that the addition of a physical channel impacts the CJ. In particular, the information search phase of the CJ is affected, as the physical channels allow the customer to interact with products and obtain sensory information that is impossible to provide online. Thus, digital companies selling deep products should take into account this.

The additional physical channel produces a systemic effect on other elements of the BM. According to the research, the main affected areas include customer relationships, customer segments and partnerships. This implies that companies need to carefully consider the systemic implications of expanding offline, as it may have a ripple effect on their BM. For example, the offline expansions can modify the relationship with the born-digital community and allow the creation of new partnerships. Lastly, companies should consider the networking opportunities arising from the physical presence.

8. Research Limitations and Future Research

As is the case with all studies, the study has a few limitations which present promising avenues for future research. The study is limited to companies that are selling deep products. This means that the results may not apply to companies selling products that do not need physical inspections before the purchase. We also have a limited number of cases, all of European origin and presence. Especially regarding the international and ‘physical’ aspects of the work, evidence from non-European countries or non-regional retailers may yield interesting insights to compare with.

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Gender diversity in the workplaces: regulatory framework, public policies, and a possible future scenario in Italy

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Abstract

Inquadramento della ricerca. Il lavoro intende esplorare il tema della diversità di genere nel mondo del lavoro in Italia.

Obiettivo del paper. Si è verificato il rapporto tra diversità e performance dell'impresa, con particolare attenzione alle eventuali performance positive determinate dalla presenza femminile nel top management.

Metodologia. Si è svolta un'analisi della normativa e delle statistiche di settore sulla diversità di genere nel mondo del lavoro. I dati ottenuti sono stati elaborati per inferire dei risultati sulla diffusione della diversità di genere nelle imprese italiane.

Risultati. Le politiche pubbliche a favore dell'imprenditoria femminile sono ancora saltuarie e frammentarie, laddove quest'ultima avrebbe bisogno di un supporto strategico per crescere, soprattutto in termini di accesso al credito e di abbattimento delle barriere per conciliare vita e lavoro.

Limiti della ricerca. La ricerca in futuro potrà essere rafforzata con un'analisi campionaria sul management delle imprese italiane, volta a verificare sul campo le ipotesi di letteratura sulla positiva correlazione tra performance e presenza femminile nel top management.

Implicazioni manageriali. In letteratura prevale l'opinione che una maggiore presenza femminile nel top management favorisca le performance organizzative, attraendo migliori risorse umane, valorizzando il capitale intellettuale dell'azienda, migliorando la reputazione aziendale e la comunicazione con i clienti, valorizzando creatività e innovazione.

Originalità del paper. Il paper presenta un'analisi completa dello status delle politiche pubbliche italiane sulla presenza femminile nelle imprese.

Parole chiave: diversità di genere; politiche pubbliche; performance delle imprese.

Framing of the research. The paper intends to explore the theme of gender diversity in the Italian workplaces.

Purpose of the paper. The relationship between diversity and company performance was verified, with particular attention to any positive performance determined by the presence of women in top management.

Methodology. An analysis of the legislation and sector statistics on gender diversity in the Italian workplaces was carried out. The data obtained were processed to infer results on the diffusion of gender diversity in Italian firms.

Results. Public policies in favor of female entrepreneurship are still sporadic and fragmented, where the latter would need strategic support to grow, especially in terms of access to credit and the removal of barriers to reconciling life and work.

Research limitations. In the future, the research could be strengthened with a sample analysis on the management of Italian firms, aimed at verifying the hypotheses in the literature on the positive correlation between performance and the presence of women in top management.

Managerial implications. The opinion prevails in the literature that a greater presence of women in top management favors organizational performance, attracting better human resources, enhancing the firms' intellectual capital, improving corporate reputation and communication with customers, enhancing creativity and innovation.

Originality of the paper. The paper presents a complete analysis of the status of Italian public policies on the presence of women in firms.

Key words: gender diversity; public policy; firm performance.

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1. Introduction

The concept of “diversity”, both among employees of a specific organization and among individuals within a whole social community (a city, a region, a country, and so on) incorporates wide, complex, and contrasting perspectives.

Even yet there is no unique and convergent definition, diversity is all about differences and dissimilarities among people about demographic variables (race, gender, age, physical abilities, socio economic status, and other personal conditions) or of another kind (values, beliefs, cultural backgrounds, economic standing, and so on) (Weber et al., 2018). Diversity, in other words, is “*any attributes that people use to tell themselves that another person is different*” (Williams and O’Reilly, 1998, p. 81). All the best practices for manage diversity focus on a certain definition of the concept of diversity, a classification of the different diversity factors, and a set of policies and actions to protect diversity, remove all the discriminations connected to one or more diversity factors, and valuate individuals and groups free from prejudice.

In the management field, the concept of *diversity management*, introduced by Roosevelt Thomas in 1990 referring to the US management context, refers to the business strategy adopted by organizations to recruitment, retention, and inclusive development of individuals from a variety of backgrounds (Thomas, 1991). Since then, due to the huge socio-cultural, political, and economic transformations, along with the globalization of trade and business models, on the one hand, and the migration flows of people across the globe, on the other, the degree of diversity within organizations has grown exponentially and diversity management has become strategic (Al Ariss and Sidani, 2016).

A copious literature on diversity management has developed over the last three decades (Yadav and Lenka, 2020a, 2020b). A lot of research paths have examined the relationship between diversity and organization performance under different point of view.

Although it is not among the purposes of this paper to analyze the relationship between gender diversity and company performance, we report below some contributions found from the analysis of the literature.

At individual level, using outcomes such as absenteeism, turnover, motivation, commitment, and satisfaction (Tsui et al., 1992; Chatman and Flynn, 2001); at workgroup level, using outcomes such as group performance, cohesion dynamics vs conflict dynamics, creativity, and innovation (Williams and O’Reilly, 1998; Schippers et al., 2003; Leslie, 2017); at organizational level, correlating diversity degree with firm productivity, financial performance (profits, return on investment, return on equity, economic value added), and firm competitiveness (Cox and Blake, 1991; Richard, 2000; Richard and Johnson, 2001; Armstrong et al., 2010).

Within the field of diversity management, a primary role is covered by the specific issues relating to gender diversity (Badru et al., 2015; Moreno-Gómez et al., 2018). The areas of the greatest interest of research, both sociological, and political and managerial, concern women’s access to the workplaces and the related education and training paths; economic treatment; career opportunities and the possibility of having in charge leadership roles in organizations (CEO, Chairman, Board member, Top Management, Executives). Despite the growing individual and collective awareness of the need to reduce the gender gap (both for salaries and career opportunities), unfortunately, the perception that “women are different” and can’t be equivalent to men in performing certain jobs still appears far from being outdated.

Gender diversity in board and at the apical management level has become a crucial issue in managerial debate for three main reasons (Kebede, 2017). First, although the percentage of women at top level remains very low, it is gradually increasing year by year. Second, the first international standards of hard and soft law for the reduction of the gender gap are being developed (the *CEDAW* was adopted by UN General Assembly since 1979; in 2011 the UN Human Rights Council adopted the *UN Guiding Principles (UNGPs) on Business and Human Rights*) and, in numerous countries, the legislation is mandating a female share within the board. Third, the nature of the question is shifting from an issue of fairness and equality to one of comparative performance

because a lot of research found a positive relation between a greater gender diversity of the board and corporate success (Curtis et al., 2012).

Although research on diversity management has not provided an unequivocal answers regarding the sign of the correlation between diversity and performance, concerning the gender diversity in top management positions some of the major benefits of women representation in the top management positions for organizational performance are the following: strong financial performance (Catalyst 2004, 2013; McKinsey 2007); attracting and retaining the best human resources and enhancing the company's intellectual capital (Australian Institute of Management, 2012); better reputation and corporate governance (Curtis et al., 2012); better communication with customers (Badal, 2014); enhance creativity and innovation (Dhir, 2015); effective leadership (Medland, 2013; Ferrer, 2015).

In the following the theme of the gender gap is explored by presenting a snapshot of the situation in the EU and in Italy, also considering the consequences of the covid19 pandemic. Subsequently, attention is focused on the current Italian regulatory framework. Finally, some concluding remarks and a possible scenario are presented.

2. Literature review

In today's communities and workplaces, there is increasing recognition of the importance of gender diversity, particularly in leadership positions. Women's representation on boards of directors has become a crucial topic of discussion and policy debate, as it is widely acknowledged that diversity in leadership leads to better decision-making, increased innovation, and improved organizational performance. Research has shown that gender diversity in the workplace is not only a matter of social justice and equality, but also has significant economic and business benefits. Despite progress in recent years, women continue to be underrepresented on corporate boards and in top management positions, indicating the need for continued efforts to promote gender diversity in the workplace.

Gender diversity in board and at the apical management level has become a crucial issue in managerial debate for three main reasons (Kebede, 2017). First, although the percentage of women at top level remains very low, it is gradually increasing year by year. Second, the first international standards of hard and soft law for the reduction of the gender gap are being developed (the CEDAW was adopted by UN General Assembly since 1979; in 2011 the UN Human Rights Council adopted the *UN Guiding Principles (UNGPs) on Business and Human Rights*) and, in numerous countries, the legislation is mandating a female share within the board. Third, the nature of the question is shifting from an issue of fairness and equality to one of comparative performance because a lot of research found a positive relation between a greater gender diversity of the board and corporate success (Curtis et al., 2012).

A copious literature on diversity management has developed over the last three decades (Yadav and Lenka, 2020a, 2020b).

The literature explores various aspects of gender diversity in leadership positions and the interventions undertaken by firms and governments to promote women's access to these roles. It acknowledges that while some policies have been effective, others have not yielded desired results, and emphasizes the crucial role of public policies in promoting diversity, particularly in sectors and countries with low representation of women.

A lot of research paths have examined the relationship between gender diversity and organizational performance under different point of view: at individual level, using outcomes such as absenteeism, turnover, motivation, commitment, and satisfaction (Tsui et al., 1992; Chatman and Flynn, 2001); at workgroup level, using outcomes such as group performance, cohesion dynamics vs conflict dynamics, creativity, and innovation (Williams and O'Reilly, 1998; Schippers et al., 2003; Leslie, 2017); at organizational level, correlating diversity degree with firm productivity, financial performance (profits, return on investment, return on equity, economic

value added), and firm competitiveness (Cox and Blake, 1991; Richard, 2000; Richard and Johnson, 2001; Armstrong et al., 2010).

Khatib et al. (2021) conducted a systematic literature review covering all publications until May 2020 (collecting 91 studies from 66 top-ranked journals in accounting, finance, and economic fields) highlights the substantial knowledge gaps and the inconsistent findings of prior studies on several aspects of the field. The Authors argue that there is a need to explore other board diversity attributes rather than focusing on the relationship between gender diversity and organizational and financial performance indicators. They suggest adding some other topics that received limited attention from scholars, such as (but not limited to): environmental performance, capital structure, intellectual capital, innovation and earnings quality, as well as the indirect effect of policy settings.

Deepening the analysis, the research investigates the effectiveness of diversity policies, implementation constraints, and policy shortcomings, and offers recommendations for improving gender diversity.

One of the recommendations is to target lower-level management positions instead of imposing quotas on top-level executive roles. The article suggests that mentoring programs for junior employees should consider factors beyond gender alone, and that addressing firm culture and promoting family-friendly policies and workplace flexibility are also important steps towards promoting gender diversity (Azmat and Boring, 2020).

The impact of the COVID-19 pandemic on the labor market is also discussed in the literature, with a focus on the gendered nature of its effects. The pandemic has exposed and exacerbated existing gender inequalities, and new ones may have been created. The article identifies five key themes to create a more gender-equitable post-pandemic labor market, including addressing gender-based labor market segregation and discrimination, building access to mutually beneficial flexibility, ensuring a more gender-equitable distribution of unpaid care, confronting gender-based violence at work and beyond, and mobilizing union agency through gender equality bargaining. Various studies are reviewed to explore these themes and suggest policy changes and actions to create a more equitable post-pandemic labor market (Foley and Cooper, 2021).

The literature also delves into the policy debate around gender board diversity, specifically the belief that women on supervisory boards can serve as role models and mentors, leading to increased representation of women in top management positions. The article provides an overview of women's presence on management and supervisory boards in corporate Europe, with a focus on countries that have implemented gender quotas for supervisory boards in public firms. Key findings include the observation that the glass ceiling appears stronger for women seeking director positions on supervisory boards compared to management boards, and that increased gender equality does not necessarily correlate with higher representation of women on management boards. The article suggests future research directions to explore new theoretical perspectives and different methodological approaches in the study of gender diversity in corporate leadership (Tyrowicz et al., 2020).

Amorelli and García-Sánchez (2021), through a very deep literature review, found a positive relation between gender diversity in a board of directors and CSR performance (transparency, commitment to sustainable development, stakeholder engagement, dissemination of social and environmental information). And it is possible to hypothesize that the better CSR performances are a valid proxy for the adoption of active ESG policies. On the other hand, although most of the available researches confirm the commitment of women directors to CSR and corporate transparency, the short-term adverse financial effects due to the complexity of sustainability strategies, can generate a significant constraint with respect to the reduction of gender gap in board of directors composition. Moreover, Authors found three main theoretical frameworks guiding empirical research into the relationship between corporate governance and CSR: Agency Theory, Stakeholders Theory, and Resource Dependence Theory. To enrich this theoretical framework, they suggest delving into the organisational and institutional factors that reinforce female aptitudes and capacities.

Furthermore, the literature analyzes how diversity and inclusion management practices are evolving in the Italian workplace through two case studies. The findings highlight that organizations are seeking integration and consistency while retaining sufficient diversity to operate and better respond to complex markets. The article suggests that developing a culture of diversity, integrating diversity into core processes, and implementing diversity as part of the company's purpose are three practices that can contain the risk of losing shared organizational identity and purpose (Ravazzani et al., 2021).

Overall, we could see various aspects of gender diversity in leadership positions, including the effectiveness of diversity policies, the impact of the COVID-19 pandemic on the labor market, the policy debate around gender board diversity, and evolving diversity and inclusion management practices in the workplace. They offer recommendations for improving gender diversity and suggests future research directions to further understand and promote gender diversity in various contexts.

Although research on diversity management has not provided an unequivocal answers regarding the sign of the correlation between diversity and performance, concerning the gender diversity in top management positions some of the major benefits of women representation in the top management positions for organizational performance are the following: strong financial performance (Catalyst 2004, 2013; McKinsey 2007); attracting and retaining the best human resources and enhancing the company's intellectual capital (Australian Institute of Management, 2012); better reputation and corporate governance (Curtis et al., 2012); better communication with customers (Badal, 2014); enhance creativity and innovation (Dhir, 2015); effective leadership (Medland, 2013; Ferrer, 2015).

3. Research methodology

Since the aim of the paper is to represent the current situation and the possible future trends in the EU and in Italy, also considering the consequences of the covid19 pandemic, in terms of methodology we selected the qualitative document analysis.

This is a form of qualitative research in which documents are interpreted by the researcher to give voice and meaning around an assessment topic (Bowen, 2009). Document analysis is an efficient and effective way of gathering data because documents are manageable and practical resources. Documents are commonplace and come in a variety of forms, making documents a very accessible and reliable source of data. Obtaining and analyzing documents is often far more cost efficient and time efficient than conducting your own research or experiments.

4. The gender gap in the workforce in EU

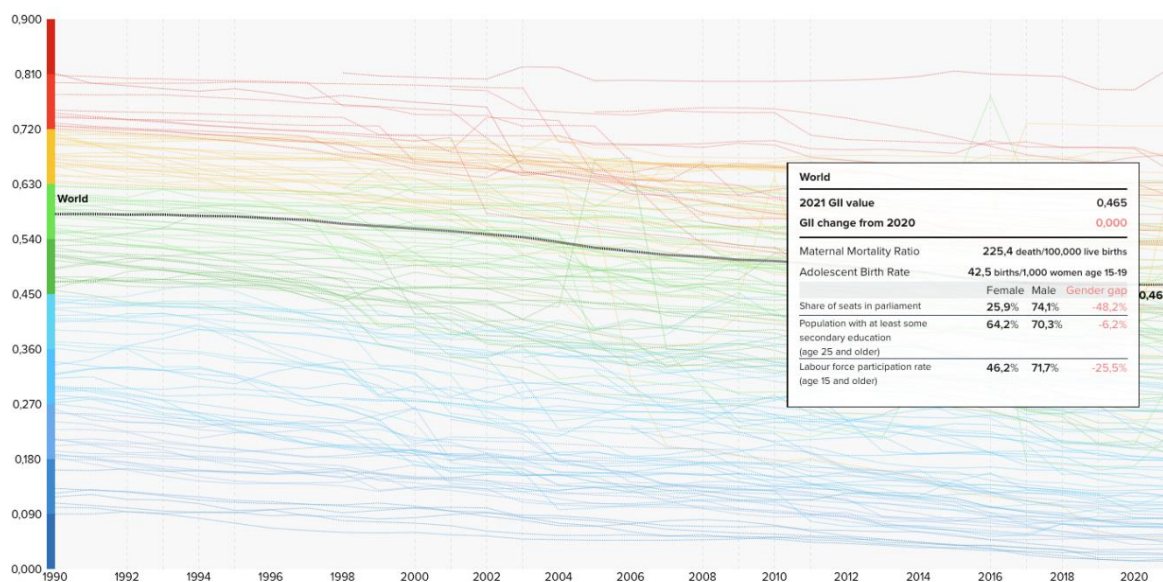
In recent years, gender-related issues have broadly concerned the entrepreneurial world, both in qualitative and quantitative terms. Although the issue of gender within organisations is much debated, the proportion of women in the business world and even more in leading positions within companies is still absolutely low compared to the male components.

At the global level many international organizations and research centre have proposed indexes to measure the gender gap. The *Gender Inequality Index* (GII) has been adopted within the UN system to measure the lack of gender equity as a primary obstacle to human development. GII is a composite metric of gender inequality using three dimensions: reproductive health, empowerment, and the labour market. A low GII value indicates low inequality between women and men, and vice-versa. The World GII was 0,581 in 1990 and it is 0,465 in 2021 (Fig. 1). For Italy, the GII was 0,213 in 1990 and it is 0,179 in 2021.

A different index, named as *Gender Gap Index* (GGI), was introduced by World Economic Forum in 2006 to have a comprehensive view on global gender-based disparities. The GGI

considers the following areas: economic participation and opportunity, educational attainment, health and survival, and political empowerment. The GII is expressed by a 0-1 scale in which 0 = total inequality and 1 = total equality. In its first edition, the ranking was of 115 countries among the 1° position of Sweden with a GGI of 0,8133 and the 115° position of Yemen with a GGI of 0,4594. Italy was on 77° place with a GGI of 0,6456. After sixteen years, the ranking is of 146 countries. At the first place there is the Iceland with a GGI of 0,908 (Sweden is at the 5° place, GGI = 0,822) and at the 146° there is Afghanistan with a GGI of 0,435. Italy is on 63° place with a GGI of 0,72.

Fig. 1: The evolution of GII over the years 1990-2021



Source: Human Development Report, 2022 - <https://hdr.undp.org>

Since 2013, also EU created its own *Gender Equality Index* (GEI) to measure the progress of gender equality in the EU. GEI is a tool based on a complex system of parameters. The maximum level of GEI is 100; the more is the value the highest is the gender equality in a certain country. In 2013, the UE GEI was 63,1 (the italian GEI was 53,3) and in 2022 the correspondent value is 68,6 (the italian GEI has growth to 65,0 showing a significant raise).

The gender gap in the workforce results from - and is influenced by - many factors, including economic shocks and the presence of long-standing structural, economic, cultural, institutional, and technological barriers. In the past decades, an increasing number of women has indeed entered the labour market, even holding leadership positions, but in a global scale, the cultural expectations and pressures, especially concerned the woman role within the family, the employer policies, and the regulatory frame continue to play a vital role in education choices as well as career trajectories.

The decade of austerity, following the 2008 global crisis, has severely affected the social infrastructure of families, especially in terms of primary caregivers, a role often embodied by women. This role has become even more impactful during the pandemic period. Geopolitical conflict and climate change are having a disproportionate impact on women. Furthermore, it is estimated that the expected increase in the cost of living will also have a greater influence on women than men, as women continue to earn less, for the same organizational role covered, compared to men.

The most important trend concerns the progressive growth of women's participation in the labour market, which parallels the rise in education levels in all EU countries. There remain, however, significant differences among the different countries. In fact, while Northern and Central European countries show an increasing percentage of women in the labour market over time,

Southern countries show a strong imbalance between male and female components in favor of the former over the latter.

The *gender gap* across the EU 28 - analyzed here as the difference between the employment rates of men and women of working age (20-64) - is 11.0 p.p. (percentage points) in 2020, meaning that the proportion of men of working age in employment (equal to 77.2%) exceeds that of women (equal to 66.2%) by 11.0 p.p. This gap was substantially the same compared to 2013: the gender gap was 10.9 p.p. due to 69.4% of employment rate for men and 58.8% for women. Going back ten years, a slightly higher level is recorded: in 2003 the gap was 11.5 p.p. due to 70.3% of employment rate for men and 58.8% for women. Thus, over the past 17 years, the gender gap in terms of employment rates in the EU has narrowed only marginally, remaining consistently above 10 p.p. (Eurostat, *European Union Labour Force Survey*, 2014; Eurostat, *Gender Statistics*, 2022).

Focusing on managerial functions, on average in the EU only, one third of managers (33%) are women, with a higher concentration in Eastern European countries. Out of all countries, Latvia stands out considerably, where there is close to parity (46% of managers are women).

Italy has just over a quarter of women managers (26%), placing it fifth from the last in the European ranking. The women/men gap in management positions widens in direct proportion to the size of the company: only 3% of large organisations have a woman at the top.

The European situation also reverberates from a global perspective. According to the World Economic Forum, in fact, it was estimated that the global gender gap would take almost a century to close unless progress narrowed it (World Economic Forum, *The Global Gender Gap Report*, 2020).

These estimates even worsened in the 2022 report. During the last three years, unfortunately, several factors, including pandemic shock, climate emergency, large-scale effects of geopolitical crisis, and rising cost of living, removing this issue from the priorities of governments and international institutions, slowed down the path to gender equality, which is currently stalled again, and the risk of reversal trend is intensifying. The consequences of this scenario, especially in some areas of the world, led to a worsening outcome with the risk of creating permanent scars in the labour market.

The latter is driven by the restriction of access to education and subsequent access to careers for women. In 2022, the global gender gap has been identified as 68.1%. At the current rate of growth, it will take 132 years to reach full parity. This represents a slight four-year improvement on the 2021 estimate (136 years to reach parity) but, aforesaid, a deterioration from the pre-pandemic situation.

This situation exists despite the countless economic benefits that equality, or at least approaching it, could bring to organisations: in this way companies are losing out on potential gains. Indeed, diversity is a factor to be considered when discussing innovation and the financial performance of an organization. In fact, several research shown that increasing the diversity of leadership teams within an organization leads to greater innovation benefits and better financial performance. An example is provided by the Boston Consulting Group (BCG) that showed a strong correlation, also statistically significant, between management team diversity and innovation segment performance. Furthermore, the study shows that even small changes in terms of diversity of the composition of a firm's management team have a significant impact in terms of financial performance. (Lorenzo et al., 2018). In an earlier study, the BCG states that diversity is "fundamental to the functioning and survival of any complex adaptive organism or system, including an organization" because of diversity enables organizations to adapt faster to change, enhancing learning capacity (Tsusaka et al., 2017).

This situation emerges even more clearly in digitally driven organizations, where creativity is combined with innovation (Lorenzo et al., 2018). These theses are also supported by an EU report. According to the EU Gender Equality Report, by 2050, improving equality is expected to lead to an increase in EU GDP per capita of between 6.1 and 9.6%, which would correspond to an increase in GDP from EUR 1.95 to 3.15 trillion. In pursuit of this goal, several directives have been issued

concerning equality between women and men in the workplace, in self-employment, in access to goods and services, in social security, and a European legal plan has been created that guarantees broad protection against discrimination.

5. A focus on the Italian regulatory framework

Despite the progress of the last decade, compared to the European situation, Italy shows significantly lower values especially in some areas of the country where strong gender inequalities persist.

Referring to the EIGE 2020 ranking¹, compared to the other European countries, Italy is sixty-third in 2022 out of 146 countries analyzed, improving its overall score by 0.001 compared to 2021, with a global position lower than Uganda and Zambia. At the European level, it ranks twenty-fifth out of thirty-five, far behind the European leaders (Iceland, Finland, and Norway). It lags far behind especially in the labour market, particularly in the post-pandemic era, which has set the situation back to an earlier generation.

Italy is historically characterized by strong gender differences in various areas: labour market, participation in decision-making processes, education levels, and access to health. In this sense, there has been a need to define a solid legal framework to protect women and to decrease gender inequality in the workplace (Carletti, 2019).

A recent development concerns Registration No. 120 of 12 July 2011 (the so-called Golfo-Mosca Law) and the Presidential Decree No. 251 of 30 November 2012, which introduced the mandatory requirement of gender balance in leadership and management positions in the control and administrative bodies of companies controlled by public administrations and companies whose shares are listed on regulated markets. In particular, the Golfo-Mosca Law introduced amendments to Articles 147-ter and 148 of the Consolidated Law on Financial Intermediation, pursuant to Legislative Decree no. 58 of 24 February 1998 (Consolidated Law on Finance), concerning the appointment of members of the boards of directors and boards of statutory auditors in listed companies. These companies are required to include provisions in their bylaws to ensure gender balance on their boards of directors and boards of statutory auditors, for three consecutive terms of office (the so-called “*sunset clause*”), starting from the first renewal after one year from the date of entry into force of the same law (which took place on 12 August 2011).

Moreover, Article 3 of the aforementioned Law extended the same indications also to companies, incorporated in Italy, controlled by public administrations pursuant to Article 2359, first and second paragraphs, of the Italian Civil Code, which are not listed on regulated markets, thus postponing the relevant implementation rules to a specific regulation to be issued pursuant to Article 17, paragraph 1, of Law No. 400 of 23 August 1988. This regulation was adopted by Presidential Decree No. 251 of the 30 November 2012, which regulated the procedures to ensure gender balance in such companies. These legislative interventions assigned to CONSOB and to the Department for Equal Opportunities (DPO) the task of supervising its implementation.

CONSOB is obliged to communicate annually to the Department for Equal Opportunities of the Presidency of the Council of Ministers the results of the checks on the implementation of the new rules on gender balance in listed companies. In addition, if the composition of the corporate bodies does not comply with the established criterion, CONSOB orders compliance within a maximum of four months. In the event of non-compliance, CONSOB sanctions the company with a fine of between EUR 100,000.00 and EUR 1,000,000.00, if the imbalance concerns the administrative bodies, and of between EUR 20,000.00 and EUR 200,000.00, if the imbalance concerns the control bodies, whilst setting a deadline of three months for compliance. In the event of further non-

¹ The European Institute for Gender Equality (EIGE - <https://eige.europa.eu>) was founded in 2010 to strengthen and promote gender equality throughout the European Union. The Gender Equality Index (GEI), on which the above-mentioned ranking is based, is a key indicator for policy to assess the evolution of gender equality over time. Each year, the index assigns each EU country, and the EU as a whole, a value from 1 to 100, which represents complete equality between men and women. The overall value is given by assessing the gender gap considering six values: work, money, knowledge, time, power, and health.

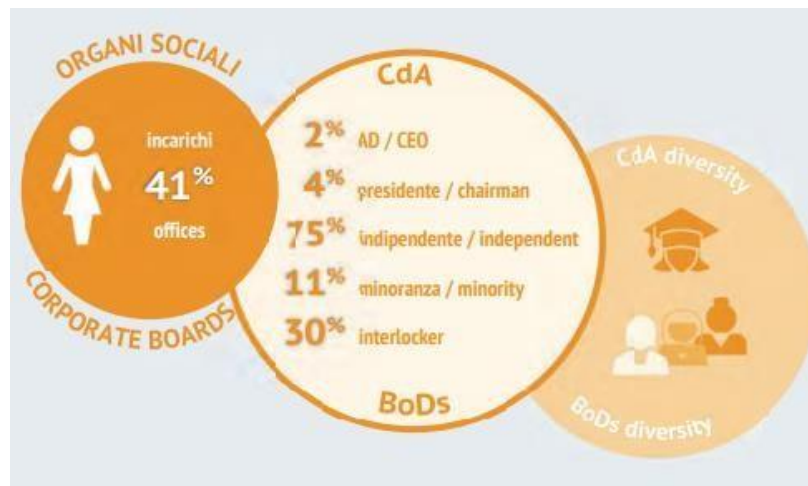
compliance, forfeiture of office for all members of the corporate body concerned is provided as a sanction.

The regulation of gender equality, with reference to corporate structures, has evolved further. In particular, regarding unlisted publicly controlled companies, the Legislative Decree No. 175 of 19 August 2016 called the “*Testo Unico in materia di società a partecipazione pubblica*” (TUSPP or Consolidated Text), as later amended by Legislative Decree No. 100 of 16 June 2017, is important. The TUSPP rationalized public companies to alleviate the burden on public spending and introduced novelties in terms of application in relation to Presidential Decree No. 251/2012. A specific obligation is being introduced, which refers to gender parity, for public administrations and not only for subsidiaries.

Lastly, the Legislative Decree No. 254/2016 stipulated that public interest entities - listed companies, banks, insurance companies, reinsurance companies - that meet certain size requirements must publish yearly a non-financial statement which must include a “*description of the social and personnel management aspects, including the actions put in place to ensure gender equality, the measures aimed at implementing the conventions of international and supranational organisations on the matter, and the ways in which dialogue with the social partners is carried out*”.

Thanks to the gender quota requirements dictated by this legislation, according to CONSOB², by the end of 2021, the percentage of women on the boards of directors of listed companies increased to an all-time high in the Italian market (reaching 41% of positions - Fig. 2).

Fig. 2: The composition of the corporate bodies of Italian listed companies



Source: CONSOB, 2021

Moreover, in the boards of directors of the 131 companies that have implemented the two-fifths gender quota required by law, at least four out of ten board members are women (which is the average number of the composition of Italian boards of directors). It should be noted, however, that there are still relatively few cases of women holding the position of CEO or Chairman of the board, compared to the more common position of independent director.

In relation to gender diversity, the Bank of Italy, in 2014, adopted the new Supervisory Provisions on the organization and corporate governance of banks (Circular No. 285, implementing Directive 2013/36/EU so-called CRD IV), stipulating that the composition of the bodies with strategic supervisory functions and with management functions of banks, should be adequately diversified, in terms of age, skills, gender and geographical origin. Subsequently and more recently, in December 2020, the Bank of Italy also proposed the introduction of a gender quota in

² CONSOB, (2021), *Report on the Corporate Governance of Italian Listed Companies*.

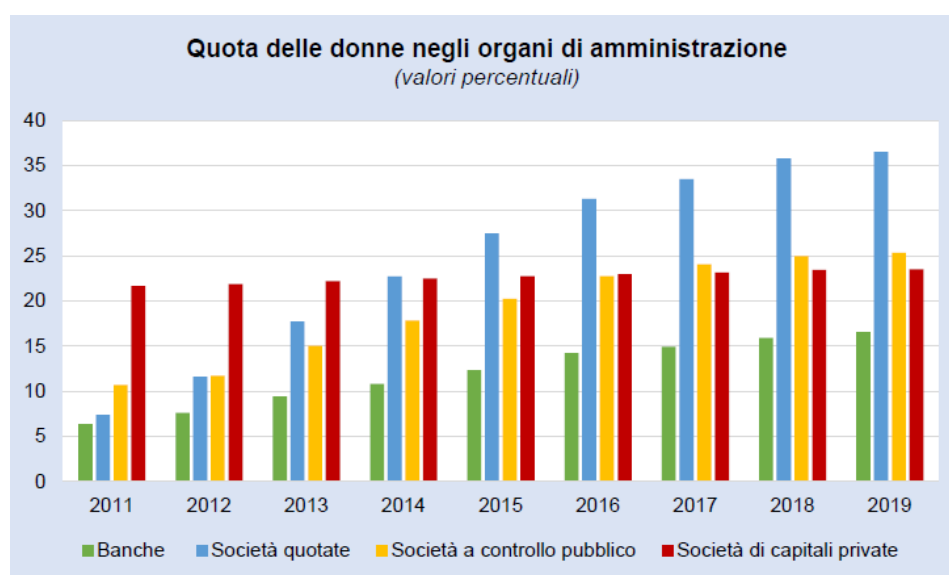
the management and control bodies of banks, to ensure an equitable distribution in the decision-making mechanisms of intermediaries.

In line with the provisions of the *Capital Requirements Directive (CRD) 2013/36/EU* and the European Banking Authority's Guidelines on the assessment of the suitability of members of the management body and key personnel (EBA/GL/2017/12), the Bank of Italy's provisions speak of gender *balance* as a further tool aimed at ensuring diversity. The latter will not only be gender-related but must encompass multifaceted aspects, such as the skills, age or geographical origin of members. This aspect of diversity aims to focus on the value of diversity: to avoid 'group mentality', i.e. subjection to prevailing behaviours, and to ensure the adoption of a plurality of approaches and perspectives when analyzing problems. The definition of a gender target (in terms of the share of the less represented gender) and the related plan to be prepared to reach the target points also in this direction. Women heading Italian companies are still limited in number, although the last decade has seen significant progress, particularly for companies, falling under the composition requirements of Law 120/2011 (Bruno et al., 2018). On November 2018, with a Memorandum of Understanding signed by the three participating Institutions (Department for Equal Opportunities of the Presidency of the Council of Ministers, CONSOB, and the Bank of Italy), the *Interinstitutional Observatory on women's participation in the management and control bodies of Italian companies* was established.

The Observatory operates as a data collection and research centre to “jointly promote initiatives aimed at the concrete implementation of female participation in the boards, with the purpose to verify over time the effects of the application of the Law no. 120/2011, also on the basis of studies and analyses making it possible the identification of potential critical and attention profiles”.

The following figures 3 - 5 show some evidence of the first report of the Observatory on female participation in the administrative and control bodies of Italian companies.

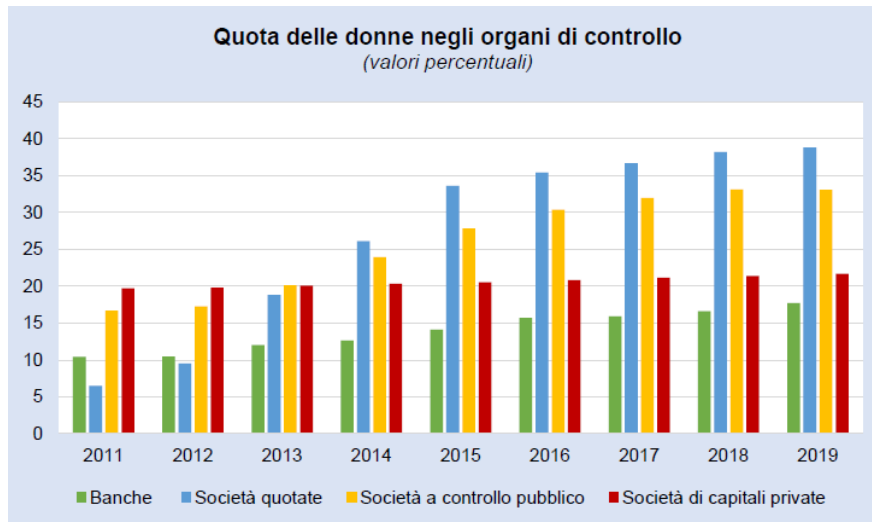
Fig. 3: Share of women on boards of directors



Source: Interinstitutional Observatory, Report 2021

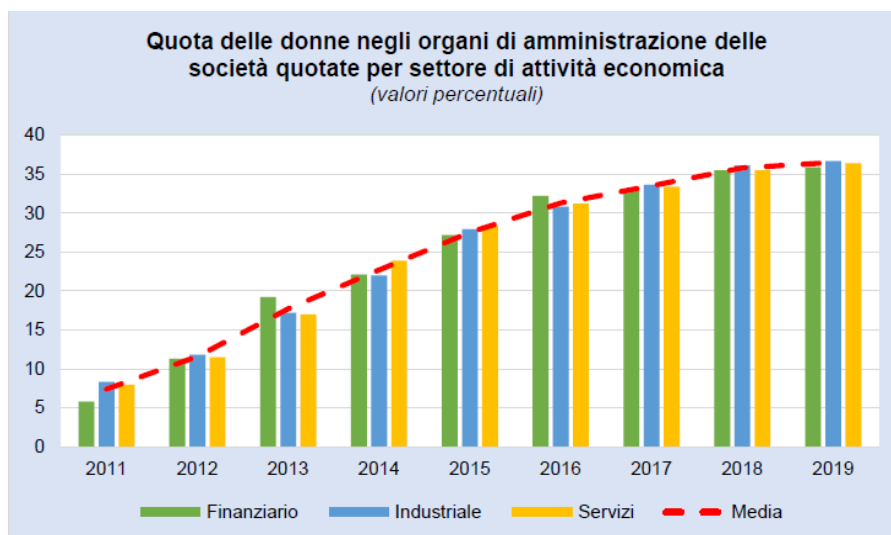
It is also interesting to analyze how the presence of women differs according to economic sector. In listed companies, the proportion of women on boards of directors in 2011 was lowest in the financial sector and highest in industry and services. Regulatory interventions have led to a more balanced situation: in Italy, significant progress was achieved with the introduction of the Law no. 120/2011.

Fig. 4: Share of women on control bodies



Source: Interinstitutional Observatory, Report 2021

Fig. 5: Share of women on boards of directors by sector of economic activity



Source: Interinstitutional Observatory, Report 2021

This progress has been recognized at European and international level. However, it should also be pointed out that heterogeneity in women's participation on the boards of directors and control as well as in the decision-making processes of companies persists. Moreover, only 2% of women hold the role of CEO in listed companies and only 1% in banks. In private companies in particular, the development has been more moderate. A wider participation of women in decision-making processes is one of the Objectives of the European Commission's Strategy on Gender Equality 2020-2025, which also aims at the approval of the proposal for a Directive presented in 2012, concerning the improvement of gender balance on the boards of directors of listed companies.

6. The pre- and post-pandemic situation

The analysis of the European and Italian situation has to start with the labour market indicators because they provide important information not only on the employment status of a region or state, but above all on how this contributes to national income generation. From this data derive indications of economic growth trends in the different areas of the European Union useful for

preparing correct intervention policies. Such indicators are crucial especially at time marred by the pandemic and its effects on the economy and employment.

The epidemiological emergency had impacts on every economic, political, and social aspect worldwide. The effects on labour market trends, in terms of employment and gender, as recorded by ISTAT and EUROSTAT, were really relevant.

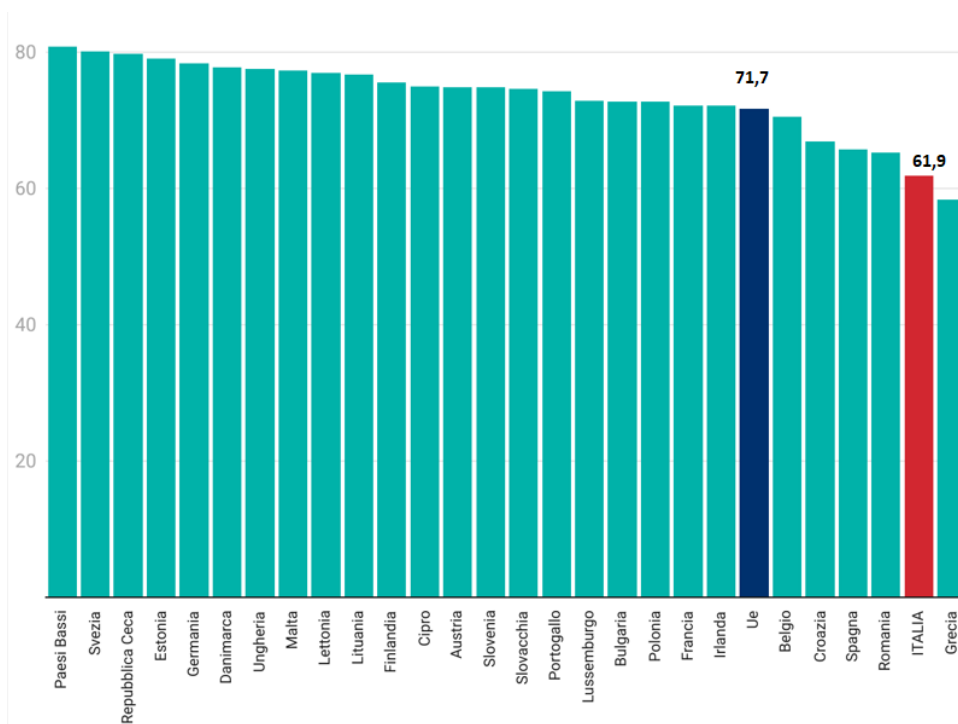
First of all, it should be pointed out that starting in 2021, the *Labour Force Survey*, the ISTAT official source which providing data on labour market trends, has been changed in order to comply with European legislation. In fact, Regulation (EU) 2019/1700 of the European Parliament and of the Council, applied as of January 1st 2021, lays down stricter requirements for the collection and processing of data on persons and households, both on individual and sample surveys, in order to streamline harmonization. A new questionnaire is being introduced to identify the condition of being *employed*, a definition based on three main aspects:

- workers in the Wage Guarantee Fund (CIG) are no longer considered employed if the absence exceeds three months;
- workers on parental leave are classified as employed even if the absence exceeds 3 months and the pay is less than 50%;
- self-employed workers are not considered employed if the absence exceeds three months, even if the activity is only temporarily suspended.

Based on these premises, it is possible to survey both European and Italian labour market trends. In 2020, the labour market was strongly affected by the global crisis generated by the health emergency. In Europe, the employment rate for the 20-64 age group decreases by 1.0% to 71.7%, while the unemployment rate increases by 0.4% to 7.2% (Fig. 6).

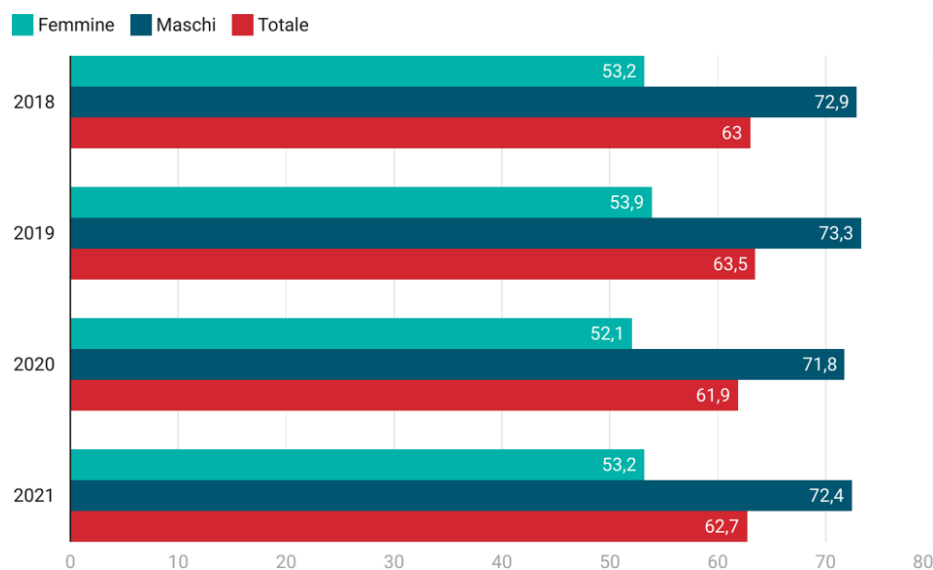
In Italy (Fig. 7), the drop in the employment rate was more intense (-1.6%), putting the country in second from last place in the European ranking, with a rate second only to that of Greece. This increased the gap with the EU average from 9.2% in 2019 to 9.8% in 2020. The gap is even sharper with reference to gender for the same age group (14.1%). The difference between the EU and Italian employment rates for the population aged between 55 and 64 is less wide: the Italian rate (53.4%) is 5.6 percentage points lower than the European average, with smaller gaps for men and wider gaps for women (-2.0 and -9.0 percentage points, respectively).

Fig. 6: Employment rate of European countries, 20-64 years. year 2020 (percentage values)



Source: ISTAT, Labour Force Survey, 2022 (<https://noi-italia.istat.it/>)

Fig. 7: Italian employment rate, 20-64 years, years 2018-2021 (percentage values)



Source: ISTAT, Labour Force Survey, 2022 (<https://noi-italia.istat.it/>)

Given the current situation, the European strategy includes, among its objectives, an increase in the employment rate, with specific reference to a broader participation of women and the over-50s in the labour market. To better understand the content of these objectives, below is the pre- and post- pandemic Italian employment situation. Compared to February, there is a growth in the number of employed people in March 2021, as against a decrease in the number of unemployed and inactive people. However, the situation is not evenly distributed. In fact, the growth in employment (+0.2%, equal to +34,000) concerns men, employees on fixed-term contracts, the self-employed and all age groups except for 35-49-year-olds who, on the other hand, are decreasing. Equally decreasing are female employment and permanent employees.

Similar, is the situation for jobseekers³: there is a 0.8% decrease compared to February, but only for men and the over 25s, while an increase is observed among women and young people aged 15-24. The unemployment rate dropped to 10.1% (-0.1 points) and increased among young people to 33.0% (+1.1 points). Since the beginning of the health emergency and up to January 2021, there have been numerous downturns in terms of employment, resulting in a tendency to drop in employment (-2.5% or -565 thousand). The decrease, this time, involves men and women, employed (-353 thousand) and self-employed (-212 thousand) as well as all age groups. The employment rate dropped by 1.1% in one year. Compared to March last year, the number of jobseekers increased sharply (+35.4%, or +652 thousand) due to the exceptional drop in unemployment that had characterized the beginning of the health emergency.

At the same time, there was a slight increase in part-time employees, whereby this consequence reached 18.6% overall, but with insignificant differences between men (9.1%) and women (31.6%).

Focusing on gender, the female employment rate in 2020 is 49%, is a figure which is not in line with other European countries. There is also a significant gap when compared to men (18.2%), as well as a distinct geographical and generational distribution: women employed in the North are 59% compared to 32.5% in the South; furthermore, women employed in the 25-34 age group are 51.9% compared to 61.8% in the 45-54 age group.

This data takes are even more significant when compared with the labour non-participation rate, which can be defined as the percentage ratio between job seekers plus inactive persons immediately available for work (part of the potential labour force) and the corresponding labour force plus inactive persons immediately available for work. In this respect, constant values are

³ <https://www.istat.it/it/archivio/265891>

observed for both men and women between 2019 and 2020. The gender gap is also unchanged and is the lowest recorded since 2005. Here, too, the figure is not evenly distributed geographically. In fact, in 2020 in southern Italy women present both the highest levels of non-participation in the labour market and a wider gap compared to men, with even more acute peaks in three regions: the rate of female non-participation in Calabria, Sicily and Campania stands at 46% while, conversely, in the regions of ValleD'Aosta, Piedmont, Liguria, Tuscany, Lombardy and Trentino Alto Adige it is less than 14.2%.

Another aspect of the worsening employment situation for women is in the part-time trend. From 2016 to 2020, the number of women workers in part-time employment remained almost stable. The problem is not numerical but qualitative: more than 60% of female workers are forced into part-time work, which is not an autonomous choice. This is well above the European average of around 20%.

Additional worsening condition is the higher frequency of women employed in low-paying positions⁴ although more than one in four women are over-educated in relation to their jobs. In fact, according to the EIGE, Italian women with the same level of education and working position, earn 46% less than their male colleagues. Women are more likely to be employed in the trade, health, and education sectors but, regardless of the sector of activity, the female presence tends to decrease when considering top positions.

Finally, a fundamental factor when dealing with gender in the workplace is Work Life Balance, i.e. the reconciliation of work and private life, especially in relation to childcare and/or elderly or sick family members. Although ISTAT⁵ indicates that 35.1% of the employed, regardless of gender, find it difficult to reconcile work and family time, in Italy it is more often women who resort to flexible working arrangements to facilitate the coexistence of the two aspects. The greatest difficulties are found mainly in the presence of pre-school-age children. This is reflected in the fact that in Italy, there is the highest share of women who have never worked to care for their children (11.1%) compared to the European average (3.7%). In this respect, too, the territorial divide between North and South of Italy is evident.

7. Gender strategies and policies of the Italian NRRP

The National Recovery and Resilience Plan (NRRP)⁶ is the document that Italy, like all EU countries, submitted on 30 April 2021 and that was approved on 22 June 2022 by the European Commission, and on 13 July by the Economic and Financial Council, to access Next Generation EU funds. This document aims to promote recovery from the crisis caused by COVID-19.

The Italian NRRP envisages an investment of EUR 191.5 billion, of which EUR 68.9 billion in grants and EUR 122.6 billion in loans, financed by the European Union and a further EUR 30.6 billion in national resources from the so-called "Supplementary Fund".

In addition to these resources, there are also those made available by the React-EU Facility, which, according to EU regulations, must be spent in the period 2021-2023. The NRRP, drafted based on the European Regulation establishing the *Recovery and Resilience Facility* (RRF)⁷, consists of six missions⁸. Sectoral transversality is a founding element of the Plan and is

⁴ https://www.istat.it/it/files//2021/03/REPORT_STRUTTURA_RETRIBUZIONI_2018.pdf

⁵ ISTAT, 2018, Labour Force Survey, ad hoc query "Reconciliation between work and family".

⁶ <https://www.mef.gov.it/en/focus/The-National-Recovery-and-Resilience-Plan-NRRP/>

⁷ *Recovery and Resilience Facility*, Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0241>

See also: Communication from the Commission to the European Parliament, the European Council, the Council, the European Central Bank, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank - Annual Sustainable Growth Strategy 2021, <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0575&from=en>

⁸ The NRRP's six missions are:

- Digitalization, Innovation, Competitiveness, Culture and Tourism;
- Green Revolution and Ecological Transition;

underpinned by the presence of three priorities, including the promotion of gender equality by increasing female employment and limiting gender discrimination.

Beyond combating gender inequality, the other two priorities concern reducing generational and territorial disparities. These are not individual interventions but are priorities that are directly or indirectly present in all six missions of the NRRP, considering differentiated outcomes for men and women.⁹ The transversality aiming at gender equality is an essential element to no longer speak of *gender policies*, which may be identified as fractional and unevenly distributed interventions. This is in line with what was stated in 2019 in Italy's European semester and what the European Commission declared in 2021 about Europe's sustainable growth. In fact, related to the first aspect, the recommendations addressed to Italy called for the need to *support the participation of women in the labour market through a comprehensive strategy, by ensuring access to quality childcare and long-term care services*. In addition, the 2021 European Commission's annual strategy reiterated the need to adopt cross-cutting policies in order to reduce the employment and pay gap between women and men, promoting a balance between work and family life, introducing income support schemes, and implementing appropriate reforms of the social protection system, taxation, and social security.

According to the multi-input, multi-output, and multi-sectoral MACGEM-IT model of the Department of the Treasury (MEF), the NRRP could produce an increase in female employment of 4% until 2026. In particular, the growth would not be evenly distributed over time: in the first two years of the Plan male and female employment evolve similarly. Only in the last three years do the NRRP measures stimulate higher growth in female employment, with a greater impact on overall employment in the final three years.

In terms of direct interventions, the most favorable measures to increase female employment are education and health policies, which are the areas with the highest female employment intensity, as well as the resources dedicated to digitalization, which characterize many components of the Plan. These direct interventions are flanked by indirect strategic activities that create situations aimed at fostering the reduction of gender inequalities in various areas of welfare, with medium- to long-term effects. This segment includes, for example, the modulation of the Plan itself, organized in specific goals, with scheduled milestones and deadlines. Some measures in the Plan adopt targets that are closely related to gender issues. Many indicators for assessing the achievement of the targets set provide for a breakdown by gender, to assess the actual improvements for the female component. Furthermore, there are bonuses for organisations that hire women for the execution of the contract defined in the Plan.

To maximize the chance of success, the actions of the NRRP must be compliant and synergetic with those of national level. To this end, in July 2021, the Department for Equal Opportunities drafted the *National Strategy for Gender Equality 2021-2026*¹⁰, in line with the *European Strategy for Gender Equality 2020-2025*.¹¹

The vision for Italy, in this sense, is represented by a scheme of values and a set of policies leading to gender equality. Recalling article 3 of the Constitution, the Italian vision aims to make Italy a country where people of all genders, ages and social backgrounds have equal opportunities for development. This vision is expressed within the National Strategy for Gender Equality 2021-2026 which strategic goal is gain 5 points in the ranking of the EIGE Gender Equality Index in the next 5 years, to rank better than the European average by 2026, with the goal

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- Infrastructure for Sustainable Mobility;
 - Education and Research;
 - Inclusion and Cohesion;
 - Health.

⁹ MINISTERO DELL'ECONOMIA E DELLE FINANZE, (2021), "Le disuguaglianze di genere in Italia e il potenziale contributo del Piano Nazionale di Ripresa e Resilienza per ridurle".

¹⁰ PRESIDENZA DEL CONSIGLIO DEI MINISTRI, DIPARTIMENTO PER LE PARI OPPORTUNITÀ, (2021), *Strategia Nazionale per la Parità di Genere*.

¹¹ COMUNICAZIONE DELLA COMMISSIONE AL PARLAMENTO EUROPEO, AL CONSIGLIO, AL COMITATO ECONOMICO E SOCIALE EUROPEO E AL COMITATO DELLE REGIONI, "Un'Unione dell'uguaglianza: la strategia per la parità di genere 2020-2025", (2020).

of being among the top 10 European countries in 10 years. To obtain this goal, an integrated system of actions must be carried out. These actions are structured in five-year objectives divided into five strategic priorities identified as follows: 1. Labour, 2. Income, 3. Skills, 4. Time, and 5. Power. (Fig. 8-9).

Fig. 8: The Italian National Strategy for Gender Equality 2021-2026: Labour and Income priorities

1 - Labour	2 - Income
<ul style="list-style-type: none"> - Tax breaks or incentives for companies hiring women, partly already provided for in the Budget 2021. - Increased incentives, especially in the southern regions. - Incentives to return to work after maternity leave, through one-off bonuses, payable directly or as additional relief to existing measures, depending on ISEE. - Reducing the exit from work of new mothers through, for example, tax breaks for the employer. - Incentives for the creation of women's businesses, through the strengthening of the Women's Entrepreneurship Fund with direct resources or connected to the issue of grants. - Provision of subsidized credit; within the SME Guarantee Fund, a specific additional allocation is set up for women's enterprises to access bank credit for the purchase of production equipment. - Introduction of additional flexibility for smart working for parents with dependent children in accordance with the age of the child, through the protection of the right to voluntary remote working, for tasks that allow such. The aim is to achieve a more rational work-life balance. - Effective use of part-time work and reduction of involuntary part-time work. - Monitoring diversity and the gender equality in both the private and PA sectors through the establishment of dedicated responsible persons. - Adoption of a Gender Policy in both private companies and PA by extending what is already indicated in the Ministerial Decree of 3 May 2018. - Introduction of a national gender equality certification system. 	<ul style="list-style-type: none"> - Definition of the Gender Pay Gap to legally define wage inequalities below the 5% threshold, according to the European Commission guidelines. - Adoption of Equal Pay measurement systems by defining the most effective indicators. - Definition of guidelines to help companies adopt a Gender Policy through ad hoc legislation. - Support for working parents with increases in the allowances and duration of parental leave, partly already implemented in the Budget 2021 and in the broader Family Act drawn up. - Analysis of penalizing factors for women and creation of subsidized credit instruments. - Reduction of the Pension Gap due to maternity, aimed at making periods of leave useful for contribution purposes in addition to recognition of the social role of childcare

Source: National Strategy for Gender Equality 2021-2026

Fig. 9: The Italian National Strategy for Gender Equality 2021-2026: Skills, Time, and Power priorities

3 - Skills	4 - Time
<ul style="list-style-type: none"> - Transversal promotion of the principle of equality at all levels of education. - Revision of textbook requirements to ensure greater visibility of texts written by women. - Promotion of interventions to combat school drop-out and lack of education and training, also including through formative activities aimed at "skilling" and "reskilling". - Enhancement of STEM disciplines with various initiatives, such as impromptu summer camps, more characteristic curricular programs, scholarships, enhanced school orientation, and university pathways to empower women. - Review of ministerial activities for orientation to university or the labour force. - Promotion for professional qualifications in fields dominated by male employment. - Support for female students - mothers with exemption from university fees and facilitation intaking examinations. - Introduction of gender quotas in university staff evaluation committees to achieve gender-neutral criteria, under penalty of disqualification of the body and sanctions for universities. - Revising the criteria for allocating MIUR funds by identifying minimum levels of gender representation. - Improving digital literacy both through curricular and extracurricular courses in compulsory schooling, through incentive systems for private companies that provide courses for the female target group, and through the creation of courses by the PA. - Mandatory training for teaching staff on gender mainstreaming and gender stereotyping, especially in STEM and high-segregation subjects. 	<ul style="list-style-type: none"> - Improving the distribution of parental responsibility through actions such as parental leave for fathers, including ad hoc measures (i.e., the so-called Child Bonus or Single Allowance for fathers). - Improving the supply of nurseries focusing mostly on the South and inland areas. - Expansion of company childcare facilities, especially in large companies, thanks also to detaxation. - Splitting parental leave to facilitate returning to work. - Tax relief for costs incurred in childcare (babysitters), geriatric care (careers) or disabled care (educators) in order to support and recognize such roles, especially of women, in caring for family members. - Hourly and annual rescheduling of school times to strengthen curricula and to meet parental needs. <p>5 - Power</p> <ul style="list-style-type: none"> - Raising the quota of the Gulf-Moscow Law, also extending its area of application. - Introduction of mandatory transparency and publication of selection short-lists (i.e., lists of candidates considered for the final selection phase) for top management levels as well as pipelines for listed companies. - Intervention on equal conditions legalization to ensure fair media exposure time for candidates of both sexes. - Implementation of existing legal provisions on gender equality in regional electoral legalization. - Introduction of gender quotas in PA governing bodies.

Source: National Strategy for Gender Equality 2021-2026

Alongside these specific actions, there is a need for cross-cutting measures covering broader aspects of life, from support for fragility to the monitoring of language that may create discrimination, from the integration of the gender perspective within health care to the definition of gender statistics.

8. Female Entrepreneurship

With the aim of “*promoting substantive equality and equal opportunities for men and women in economic and entrepreneurial activity*”, legislation 215 of 1992¹² paragraph 2 gives a definition of women’s enterprises in terms of access to benefits, according to these elements:

The following are eligible for the benefits of the law:

- *cooperatives and partnerships, at least 60% of which are owned by women, joint stock companies, at least two-thirds of whose shares are owned by women and at least two-thirds of whose boards of directors are made up of women, as well as sole ownerships run by women, operating in the industrial, craft, agricultural, trade, tourism, and service sectors;*
- *companies, or their consortia, associations, bodies, business promotion companies also with mixed public and private capital, training centers and professional associations that promote entrepreneurial training courses or consultancy and technical and managerial assistance services with at least 70% reserved for women.*

It is possible to supplement this definition with the one provided by the Unioncamere Report 2022¹³, whereby “female” may be qualified as:

- sole ownerships owned or managed by women;
- partnerships in which the majority of partners are female;
- corporations in which the majority of the shares are held by women, or in which the majority of the offices are held by women, or corporations in which the average of the shares are held by women, and the shares held by women are more than 50%;
- co-operative enterprises where the majority of members are women.

Based on these classifications, according to the Unioncamere Report in Italy, in 2021 the enterprises led by women will be 22% of the total in the area, with an increase in the last year of +0.5%, despite the COVID-19 having slowed down the pace of growth. The growth trends, from a geographical point of view, run counter to the employment data: the highest concentration of women’s enterprises is in the South and the region with the highest growth is Campania, where the core activity is mainly in commerce. This results on the one hand from self-employment and on the other from the tendency to equality of education between genders.

The role of women in doing business is difficult to evaluate if it refers only to statistical data, it is necessary to indicate the context and the relationship with the social environment. According to the Green Italy 2021 report¹⁴ companies run by women promote more social responsibility activities, are more attentive to the issues of inclusion and sustainability with a desire to give back to society what they have taken from the company they lead. An example is that given by the Unioncamere 2020 report¹⁵: more than 70% of women-led companies have invested in individual well-being initiatives at work, compared to 67% of other companies.

Women-led companies also have on average a better governance than male-led companies, partly because they use CEOs from outside the family, when necessary, thus improving the quality of the company’s transparency. In addition, companies controlled by women grow more and are less indebted.

Moreover, female entrepreneurship has long-range beneficial effects through a multiplier lever. According to a McKinsey 2022 survey¹⁶, women are ambitious and hardworking. The research revealed that we’re amid a “Great Breakup.” Women are demanding more from their work, and they’re leaving their companies. Women leaders are switching jobs at the highest rates we’ve ever seen, and at higher rates than men in leadership. If companies don’t act, they risk losing not only their current women leaders but also the next generation of women leaders. Young women are more inclusive and empathetic leaders and want to work for companies that prioritize cultural

¹² The Italian Law N. 215 of 1992 is titled “Positive actions for women’s entrepreneurship”.

¹³ ISTITUTO GUGLIELMO TAGLIACARNE, (2022), *V National Report on Female Entrepreneurship in Italy*.

¹⁴ UNIONCAMERE, (2021), 12° Green Italy Report 2021, *A people-friendly economy for the future of Europe*.

¹⁵ ISTITUTO GUGLIELMO TAGLIACARNE, (2020), *IV National Report on Female Entrepreneurship in Italy*.

¹⁶ MCKINSEY, (2022), *Women in the Workplace 2022*.

changes which improve work: flexibility, employee well-being and diversity, equity, and inclusion. They're watching senior women leave for better opportunities, and they're prepared to do the same.

9. Concluding remarks, possible scenarios, and practical implications.

Diversity in general and gender diversity in particular represent an increasingly strategic issue in management. Workforce diversity is widely considered to improve the knowledge, perspectives, and skills that results in creativity, innovation, and decision-making power within organizations. On the other hand, while women play a vital role in an organization's performance, their representation in top positions is still limited. Furthermore, the country also needs the contribution of female entrepreneurship to implement its ability to create value in a highly complex competitive environment on an international scale.

To this end, however, female entrepreneurship need a strategic support to grow and public policies can't neither be fragmentary nor occasional. Actions isolated or not coordinated with each other with respect to a coherent overall long-term vision can be more harmful than good, creating further inequality. Furthermore, new policies must be implemented effectively, rapidly, and efficiently and must be constantly monitored to assess whether the implemented actions are achieving the desired results.

They represent an essential prerequisite all the actions aimed at creating infrastructures and supporting the work-life balance. The aim is to increase women's autonomy and to break down gender stereotypes, as well as to encourage women to acquire skills also in scientific and technological fields, in order to play an increasingly important role in imagination, creativity, and innovation processes.

Another key element to be kept extremely under control is women access to credit, which, to date, represents one of the main barriers to access for female entrepreneurs. An important aspect in this regard could be support through the recognition of interest-free loans and facilitated access to the special section of the Guarantee Fund for Small and Medium Enterprises - Equal Opportunities Section. In this way, liquidity is guaranteed not in terms of direct disbursement, but as support in terms of guarantees for access to credit, without the costs of sureties or insurance policies.

It is also necessary to encourage a radical social and cultural renewal by promoting female entrepreneurship through collective and bottom-up processes that improve the valorization of women's skills and responsibilities by eliminating all forms of inequality and dangerous stereotypes. Such cultural openness could aim at the creation and strengthening of partnerships between countries, triggering a positive learning chain on gender issues, in order to implement active inclusion policies and initiate a change of course within all workplaces, both large and small.

Moreover, it is desirable to strengthen, also through further legislative interventions, *diversity and inclusion management*, a need which is increasingly felt in evolved contexts that are aware that diversity management can represent an opportunity and not a threat. The purpose of such an intervention is not only oriented towards promoting equality of roles between women and men but is intended to also foster a commendable positioning of the Country within the international markets in order to improve the factors on which its competitiveness is based.

Finally, in terms of practical implications, we believe that the main result of the paper is the evidence of a serious acceleration of a *coercive isomorphism* (changes to the regulatory framework involve pressures on some organisations from other organisations, DiMaggio and Powell, 1983) towards the adoption of some emerging institutional logics (Thornton and Ocasio, 1999).

First of all, by regulators and policymakers, the results reveal a clear institutional pressure to reinforce corporate governance principles to increase the presence of female directors in order to achieve a balanced composition of gender on boards of directors. With reference to Italy, the case of the Golfo-Mosca law (Law 120/2011) about ten years (June 28, 2011) after its approval is emblematic. The Law imposes the presence of at least 1/5 of each gender for the first election of

the bodies following 12 August 2012. The quota increases to 1/3 for the two subsequent elections. Law 160/2019 extended the mechanism introduced by the Golfo-Mosca Law, initially referred to three consecutive mandates, to six consecutive mandates and increased the women's quota to 40%. Ten years later, the number of women on the boards of listed companies in Italy has gone from around 7% (2012) to around 43% (2020). The Golfo-Mosca Law is the first legislation on gender equality that can be placed at the level of regulatory compliance requirement. It provides, in the event of non-compliance with regulatory obligations, the risk of non-compliance. Non-compliance implies significant sanctions, not only pecuniary, but even, as a final measure, the forfeiture of the entire board of directors. Supervision and sanctioning power is entrusted directly to Consob. The constraints established by the law extend to investee companies, with respect to which supervision is entrusted to the Presidency of the Council of Ministers or, upon its delegation, to the Ministry of Equal Opportunities.

Secondly, for the ownership of companies (shareholder point of view), interested in increasing the value creation capabilities through a greater engagement of relevant stakeholders, the analysis of the literature shows that the most significant presence of women on boards of directors and in the top management improves CSR performance by triggering a change in organizations that directs them towards more sustainable and more balanced strategies among all the players involved.

Finally, under a social point of view, companies are subject to huge pressures to increase female representation on main decision roles, however, it seems suitable to consider certain professional characters of female directors and their sensitivity towards sustainability in order to increase the value of the company and achieve harmony with the stakeholders through the implementation of sustainable strategies. In this sense, the boards would have a greater predisposition to lead a positive change in the social and environmental impact of the business world.

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Diversity & Inclusion: una review bibliometrica

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Abstract

Inquadramento della ricerca. Il campo di ricerca accademica della diversità ed inclusione è molto vasto e abbraccia diverse discipline come il management, la sociologia, la psicologia, le scienze dell'educazione e gli studi di genere. Tale varietà suggerisce la necessità di una sua analisi da una prospettiva più orientata agli aspetti organizzativi e manageriali.

Obiettivo del paper. Il presente studio si propone di condurre un'analisi bibliometrica della letteratura riguardante il tema della Diversity & Inclusion e di conseguenza una mappatura scientifica della struttura concettuale, sociale e intellettuale.

Metodologia. Utilizzando Bibliometrix, un pacchetto di R Studio, sono state analizzate 592 pubblicazioni provenienti dal database di Web of Science, a partire dal 2010.

Risultati. La ricerca evidenzia tanto le performance in termini di autori, istituzioni e paesi che si occupano della tematica quanto le strutture concettuali (analisi della co-occorrenza delle keyword), sociale (analisi dei rapporti di co-authorship) e intellettuale (tracciato storiografico).

Limiti della ricerca. Al pari di altre review, la scelta del database utilizzato, l'imposizione di limiti temporali e linguistici, nonché la scelta delle keyword potrebbero aver limitato la completezza della letteratura analizzata.

Implicazioni manageriali. I risultati possono essere utili ad orientare la cultura aziendale e le decisioni strategiche nell'ambito di una politica orientata alla sostenibilità e all'inclusione sociale.

Originalità del paper. Il presente lavoro adotta una prospettiva più ampia e attuale, che tiene conto delle performance di studiosi, istituzioni e paesi, mappando le strutture concettuali, sociali e intellettuali della letteratura di riferimento.

Parole chiave: diversità; inclusione; equità; review; bibliometrix

Framing of the research. The academic research field on diversity and inclusion is very broad and embraces different disciplines such as management, sociology, psychology, education sciences, and gender studies. Such variety suggests the need to analyse these themes from a perspective more oriented to organizational and managerial aspects.

Purpose of the paper. The purpose of this study is to conduct a bibliometric analysis of the literature concerning the topic of Diversity & Inclusion and consequently a scientific mapping of the conceptual, social and intellectual framework.

Methodology. Using Bibliometrix, an R Studio package, 592 publications were analyzed from the Web of Science database, as of 2010.

Results. The research highlights as much the performance in terms of authors, institutions and countries dealing with the topic as the conceptual (keyword co-occurrence analysis), social (co-authorship relationship analysis) and intellectual (historiographical tracing) structures.

Research limitations. Like other reviews, the choice of database used, the imposition of time and language limits, as well as the choice of keywords may have limited the comprehensiveness of the literature analyzed.

Managerial implications. The results may be useful in guiding corporate culture and strategic decisions in the context of a policy oriented toward sustainability and social inclusion.

Originality of the paper. This paper adopts a broader perspective, taking into account the performance of scholars, institutions and countries, mapping the conceptual, social and intellectual structures of the relevant literature.

Key words: diversity; inclusion; equality; review; bibliometric

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Introduzione

Negli ultimi anni, l'attenzione ai temi della diversità e dell'inclusione è divenuta una prerogativa fondamentale per una corretta gestione d'impresa. Lo sviluppo della *Diversity & Inclusion* (d'ora in avanti D&I) si è posto, anche in Italia, come condizione essenziale per la crescita delle imprese e la promozione di efficienza e competitività (Osservatorio D&I di UN Global Compact Network Italia, 2021).

Nel contesto attuale, in coerenza con l'Agenda 2030 e l'appello "*Leave No One Behind*"¹, le organizzazioni imprenditoriali si sono rese conto che la gestione della D&I influenzerà il funzionamento organizzativo e la competitività dell'impresa (Langdon *et al.*, 2002). Diversi sono gli studi in tale direzione. Ad esempio, secondo il report dell'Organizzazione internazionale del lavoro (*The Contribution of social dialogue to gender equality*, 2019), le imprese con "culture e politiche aziendali più inclusive" registrano un aumento del 59% nell'innovazione e una migliore "valutazione dell'interesse e della domanda dei consumatori" del 37%. Uno studio Kellogg Insight (*Better Decisions Through Diversity*, 2010) su 49 annunci sulla diversità di genere da parte di società tecnologiche dal 2014 al 2018 ha rivelato che "se due società pubblicassero i loro dati sulla diversità lo stesso giorno, il prezzo delle azioni dell'azienda con il 40% di donne aumenterebbe di un punto percentuale in più, rispetto al prezzo delle azioni di un'azienda con il 30% di donne". Effetti positivi in termini di redditività sono evidenti secondo uno studio di McKinsey & Company (2015), anche se le motivazioni principali che spingono le imprese ad attuare azioni in ambito D&I sono da ricercare nella "necessità di migliorare il benessere del personale" (WordDay, 2021).

Nonostante una consapevolezza circa la necessità per il management di occuparsi delle questioni D&I, diversi sono gli approcci organizzativi alla gestione di tali tematiche (Roberson, 2006). La D&I come campo di ricerca accademica è molto vasto e abbraccia diverse discipline come il management, la sociologia, la psicologia, le scienze dell'educazione e gli studi di genere. Tale varietà, evidentemente, suggerisce l'utilizzo di diverse chiavi metodologiche e interpretative utili ad una più corretta interpretazione di questo ampio fenomeno.

L'obiettivo del presente lavoro è stato quello di effettuare un'analisi bibliometrica della letteratura sulla D&I attraverso l'utilizzo del software Bibliometrix, che ha preso in considerazione 592 contributi provenienti dal database di Web of Science pubblicati a partire dal 2010.

A nostro parere il lavoro contribuisce in modo significativo al dibattito scientifico in atto attraverso diverse prospettive: in primo luogo, si cerca di contribuire ad una corretta sistematizzazione, in chiave manageriale e gestionale, dei concetti di diversità e inclusione. A differenza di altre review sul tema, il presente contributo adotta una prospettiva di più ampio respiro nei confronti della diversity, dato che, ad esempio, i tre lavori di review più citati (Majumder *et al.*, 2017; Amorelli e Garcia-Sanchez, 2021; Khatib *et al.*, 2021), prendono in considerazione la diversità solo e soltanto attraverso uno specifico angolo visuale; l'analisi evidenzia, inoltre, macrotemi e filoni principali di ricerca che insistono su Diversità e Inclusione, non mancando peraltro di analizzare le performance di studiosi, istituzioni e paesi, nonché di mappare le strutture concettuali, sociali e intellettuali della letteratura di riferimento². Infine, la postura della letteratura nei confronti del comportamento manageriale in materia di diversità e inclusione è passata da emergente a sempre più trainante, intrecciandosi con le questioni relative all'etica d'impresa. Pertanto, un approfondimento tematico del presente contributo appare quanto più originale e attuale.

¹ Il principio "Leave no one behind" è la promessa centrale e trasformativa dell'Agenda 2030 per lo Sviluppo sostenibile: esso impegna l'Italia così come tutti gli altri Paesi ad affrontare discriminazioni e disegualianze che minano i diritti di ciascuno, inclusi quelli delle persone con disabilità.

² In particolare, una mappatura scientifica del field descrive l'evoluzione delle principali tematiche dal 2010 a oggi, evidenziando ad esempio come la definizione di diversità si sia evoluta nel tempo e si sia articolata in sotto-temi più specifici, come la diversità etnica, demografica, socio-culturale, oltre che di genere.

1. Diversità e inclusione: un inquadramento

Il termine diversità è spesso dato per scontato dalle organizzazioni e nella letteratura sulla diversità (Harrison e Klein, 2007) e per tali motivi non è agevole pervenire ad una definizione univoca di diversità in quanto spesso vengono usati termini diversi in modo intercambiabile (ad esempio, dispersione, eterogeneità, dissimilarità, divergenza e variazione). Una possibile definizione è quella riportata da Harrison e Klein (2007) secondo i quali la diversità è “la distribuzione delle differenze tra i membri di un’unità rispetto a un attributo comune”. Tale definizione considera dunque “le diverse prospettive e gli approcci al lavoro che i membri di diversi gruppi identitari portano con sé” (Thomas e Ely, 1996). La letteratura distingue, altresì, tra diversità visibile o demografica (come la razza, il sesso e l’età), da quella invisibile o informativa (come l’esperienza lavorativa, la formazione il background educativo, il background funzionale e la posizione in azienda), nonché la diversità di valore (ad esempio, la diversità dovuta dalla cultura o dalla religione), ovvero da caratteristiche psicologiche come personalità e atteggiamenti (Harrison *et al.*, 1998). Pertanto, la diversità può essere definita in termini di caratteristiche osservabili e non osservabili (Milliken e Martins, 1996), quest’ultime più difficili da misurare e pertanto da analizzare. Larkey (1996), in effetti, definisce la diversità come una differenza di prospettive che si traduce in potenziali differenze comportamentali tra gruppi culturali e differenze di identità tra i membri del gruppo in relazione ad altri gruppi. La diversità, dunque, è un aspetto che caratterizza inevitabilmente la vita organizzativa di una impresa ed è un elemento fondamentale da tenere in considerazione per il management delle risorse umane nelle organizzazioni (Harris *et al.*, 2007). Si aggiunga inoltre che fenomeni economici, come l’internazionalizzazione delle imprese e la globalizzazione dei mercati, da un lato, nonché importanti eventi sociali, come le migrazioni e la femminilizzazione del mercato del lavoro, dall’altro, hanno prodotto una forza lavoro diversa per genere, cultura, religione, spingendo le imprese ad affrontare le problematiche legate alla diversità (Cox e Blake, 1991; Iles, 1995; Agocs e Burr, 1996; Ayoko e Hartel, 2006; Seymen, 2006). Pertanto per gestire una forza lavoro multiculturale, nel rispetto delle diverse tradizioni e culture (Iles, 1995), risulta necessario implementare un nuovo approccio di gestione delle risorse umane che integri e valorizzi le diversità. La gestione della diversità, nota in letteratura internazionale come diversity management, sembra rappresentare una possibile risposta a queste problematiche. Nell’evoluzione del costrutto di diversity management si possono individuare tradizionalmente tre fasi distinte che corrispondono a tre fasi dell’evoluzione organizzativa: fase monoculturale, fase plurale, fase multiculturale (Cox, 1994, 2001). La fase monoculturale si riferisce alla presenza di imprese culturalmente e demograficamente omogenee considerate come “monolitiche”; tali imprese considerano i lavoratori come tutti uguali, senza fare distinzioni. Il modello dominante è quello del “maschio bianco” e quindi le donne e le persone di colore si devono adattare a tale modello organizzativo dominante (Cox, 1994, 2001; Gardenswartz e Rowe, 1993). La seconda fase, definita dell’impresa plurale, è una fase non discriminatoria. Questo tipo di impresa è generalmente più eterogenea rispetto all’organizzazione monolitica. Vengono maggiormente accettate persone provenienti da differenti background culturali che differiscono dal gruppo dominante. Ad esempio, vengono assunte con più facilità le donne e le minoranze e ne viene facilitata la promozione all’interno dell’impresa. Lo scopo di questa fase è quello di eliminare i vantaggi attribuiti ingiustamente al gruppo di maggioranza (Cox, 1994, 2001; Gardenswartz e Rowe, 1993). La terza fase, definita multiculturale, è una fase in cui le imprese riconoscono differenze di cultura, background, valori dei lavoratori e sostengono le differenze come aspetto fondante della cultura organizzativa. La flessibilità delle politiche aziendali e delle procedure assicura che nessuno sia messo in una posizione di possibile sfruttamento (Cox, 2001, 1994; Gardenswartz e Rowe, 1993).

Strettamente legata al concetto di diversità è quello di inclusione, laddove tale concetto è diverso da quello di diversità in quanto si focalizza non solo sul mix di persone, ma anche sull’incorporazione di ogni dipendente nei processi organizzativi e nella cultura d’impresa.

L'inclusione è dunque "il grado in cui gli individui si sentono parte dei processi organizzativi avendo accesso alle informazioni, alle risorse, partecipando attivamente a gruppi di lavoro ed influenzando il processo decisionale" (Mor Barak e Cherin, 1998).

Il concetto di inclusione è, tuttavia, più difficile da definire, in quanto è meno visibile: valorizzare il rispetto delle persone di ogni provenienza e accettare le caratteristiche che le rendono uniche è compito arduo; la letteratura esistente sul tema è il più delle volte discordante anche se è possibile individuare un fil rouge, circa la capacità di facilitare l'inclusione delle persone all'interno dei propri gruppi di lavoro attraverso la progettazione e l'implementazione di politiche aziendali orientate a soddisfare i suoi bisogni di appartenenza e di unicità. Infatti, Pelled, Ledford e Mohrman (1999) hanno definito l'inclusione come "il grado in cui un dipendente è accettato e trattato come un insider dagli altri in un sistema di lavoro". Roberson (2006) sostiene che l'inclusione si riferisce alla "rimozione degli ostacoli e alla piena partecipazione e al contributo dei dipendenti nelle organizzazioni", e Miller (1998) analogamente, descrive l'inclusione come la misura in cui gli individui diversi "sono autorizzati a partecipare e sono messi in grado di contribuire pienamente".

Quando gli individui percepiscono un senso di appartenenza, hanno l'opportunità di essere presenti, di far sentire e apprezzare la propria voce e di impegnarsi in attività fondamentali per conto del collettivo, l'organizzazione imprenditoriale può definirsi inclusiva (Lirio *et al.*, 2008; Wasserman *et al.*, 2008).

Ricerche precedenti sostengono che maggiore è la percezione dei dipendenti di essere accettati dall'organizzazione, maggiore è il grado di soddisfazione che essi provano nei confronti dell'organizzazione e maggiore è il loro impegno nei confronti dell'organizzazione (Lawler, 1994; Lawler, 1995; Deming, 1986); ne è una dimostrazione concreta l'indagine condotta dal Welfare Index Pmi 2022 che dimostra una stretta correlazione tra politiche del welfare e produttività³. Teorie sociopsicologiche del comportamento interpersonale e la letteratura sul comportamento organizzativo offrono approfondimenti importanti sulla inclusione-esclusione nel contesto delle interazioni tra i singoli dipendenti, gruppi e ambiente di lavoro. Ad esempio, Leary e Downs (1995) sostengono che le reazioni degli altri, in particolare il grado di accettazione e inclusione, di rifiuto e di esclusione dell'individuo, sono fondamentali per il benessere fisico e psicologico. In quello che hanno definito il "modello del sociometro", l'autostima è considerata un misuratore psicologico, o sociometro, un indicatore che permette alle persone di monitorare le reazioni di inclusione o di esclusione nei loro confronti dal loro ambiente (Leary *et al.*, 1995). Piuttosto che enfatizzare la differenza come un bene organizzativo che ha valore di scambio in termini di performance economica, l'inclusione si concentra sul grado in cui gli individui si sentono parte dei processi organizzativi critici.

L'inclusione rappresenta, quindi, la capacità di una persona di contribuire pienamente ed efficacemente a un'organizzazione (Miller, 1998; Mor Barak e Cherin, 1998); essa è, quindi, favorita dal raggiungimento dell'equilibrio tra l'appartenenza a un gruppo e l'essere apprezzati per caratteristiche individuali uniche (Shore *et al.*, 2011). Man mano che gli individui sentono di essere membri importanti dell'organizzazione e che i loro talenti e le loro caratteristiche uniche sono riconosciuti e apprezzati, aumentano il grado di inclusione (Nishii, 2013; Riva *et al.*, 2011).

Ricerche emergenti hanno suggerito che quando i dipendenti si sentono inclusi nel loro ambiente di lavoro, l'impegno organizzativo, la fiducia, il benessere, la creatività e l'innovazione migliorano (Brimhall *et al.*, 2014; Mor Barak *et al.*, 2006; Riva *et al.*, 2001).

³ Tale è stata per anni la politica adottata da Adriano Olivetti che è passato alla storia come il primo vero ideatore dell'umanesimo imprenditoriale; la fabbrica di Olivetti tentò di costruire un ponte tra il mondo intellettuale e la classe operaia; l'impresa era infatti composta da scrittori, artisti, disegnatori, poeti e intellettuali come ad esempio Franco Fortini, Paolo Volponi e Ottiero Ottieri. Prendendo le mosse da questa politica di inclusione culturale, ne discese una altrettanto forte sull'inclusione sociale: i dipendenti dovevano operare a contatto con la natura, non subire pressanti e tristi barriere architettoniche e questo di fatto, avrebbe sprigionato la loro creatività e produttività.

3. Metodologia

Il presente studio si basa su un'analisi bibliometrica. La bibliometria può essere definita come una branca dell'informatica che ha lo scopo di misurare l'impatto delle pubblicazioni scientifiche e il relativo livello di diffusione della conoscenza attraverso tecniche statistiche (Broadus, 1987; Cuccurullo *et al.*, 2016; Merigò *et al.*, 2015). Questo tipo di analisi consente ai ricercatori di esaminare una quantità di dati rispetto alle review sistematiche della letteratura, mantenendo al contempo alto il livello di rigore, solidità scientifica, trasparenza e replicabilità (Dada, 2018; Rey-Martí *et al.*, 2016). L'uso delle tecniche bibliometriche in questo paper è volto ad analizzare i lavori accademici sulla diversità e l'inclusione nei settori del business e del management, con l'intento di poter identificare punti di discontinuità, specifici macro-temi legati a determinati filoni di letteratura sia noti che meno battuti; il tutto attraverso trend temporali molto utili a delineare le dinamiche evolutive. Per questo è stata condotta un'analisi quantitativa, applicando l'analisi della performance e la mappatura scientifica, utilizzando il software RStudio (RStudio Team, 2016), uno degli strumenti più utilizzati da ricercatori e analisti di dati. Ai fini del presente studio si è rivelato particolarmente utile il pacchetto Bibliometrix, sviluppato da Aria e Cuccurullo (2017): questo strumento consente di effettuare analisi descrittive a partire da database bibliografici⁴. Inoltre, come in altri studi bibliometrici (Baima *et al.*, 2020; Martínez-Climent *et al.*, 2018), è stata effettuata un'analisi del contenuto degli articoli più influenti per indagare l'evoluzione tematica della disciplina.

3.1 Raccolta ed estrazione dei dati

Il primo passaggio è stato la raccolta dei dati grezzi da cui possono essere ricavati i metadati necessari (ad esempio, autori, paesi, riferimenti o numero di citazioni) (Carvalho *et al.*, 2013). Esistono diversi database scientifici, ma i due più rilevanti in termini di numero di pubblicazioni contenute sono Web of Science (WoS) di Clarivate Analytics e SCOPUS, di Elsevier. Il database d'elezione per il presente studio è stata la Core Collection di WoS, a cui alcuni studiosi riconoscono standard qualitativi più elevati rispetto a SCOPUS (Merigò *et al.*, 2015).

Per la raccolta dati da WoS è stata utilizzata una query che interroga il database cercando contributi all'intersezione di tre filoni tematici combinando diversi raggruppamenti di keyword e stringhe di ricerca: i) la corporate governance (“*corporate governance*” OR “*director**” OR “*board**” OR “*board* structure*” OR “*board* characteristic**” OR “*board* composition*” OR “*board* of director**” OR “*corporate control*” OR “*governance of corporation*”); ii) la diversity e l'inclusione (“*diversity*” OR “*inclusion*”); iii) la governance sostenibile (“*environment* soc* govern**” OR “*ESG*” OR “*CSR*” OR “*corporate* soc* respons**”). La query ha interessato in particolare il field “Topic”, che in WoS restituisce articoli corrispondenti alle stringhe ricercate se esse sono contenute in titolo, abstract, author keywords, e *Keywords Plus*⁵. L'operatore booleano “OR” e l'asterisco sono stati utilizzati per catturare i paper contenenti combinazioni leggermente differenti delle keyword selezionate e keyword tra loro affini a livello semantico. Stanti le ulteriori restrizioni applicate alla ricerca in termini di anno di pubblicazione (successivo al 2009, lingua (Inglese) e subject area (“*Business*”, “*Management*” e “*Business Finance*”), il sample finale risulta composto da 592 pubblicazioni, riconducibili a 191 fonti scientifiche (in maggioranza journal), scritte da 1330 autori afferenti a 778 istituzioni in 80 paesi del mondo.

3.2 Analisi delle performance

Per l'analisi delle performance dei ricercatori e dei paper presenti nel sample sono stati utilizzati

⁴ Bibliometrix, in altre parole, è uno strumento sviluppato nel linguaggio statistico computazionale e grafico, secondo un flusso di lavoro bibliometrico logico, usato soprattutto per la mappatura scientifica. Trattandosi di un open software, riesce ad ottenere una notevole base di dati dalla web community degli utenti ed include tutti i principali metodi di analisi bibliometrici.

⁵ Le *Keywords Plus* sono parole chiave generate automaticamente da WoS in base ai termini che compaiono più di una volta nella bibliografia di un documento.

indicatori quantitativi (che manifestano la prolificità del ricercatore) e qualitativi (che misurano l'impatto scientifico). Sul versante quantitativo nella presente review l'analisi ha consentito di evidenziare i 25 autori, istituzioni, paesi e fonti più performanti in termini di prolificità degli output di ricerca; su quello qualitativo, invece, si riportano i 25 paper più influenti dell'intero sample per numero di citazioni normalizzate. Il dato delle citazioni normalizzate è stato estratto dall'analisi del citation network effettuata tramite VOSviewer, un altro software bibliometrico molto accreditato presso la comunità scientifica per la mappatura scientifica della letteratura (van Eck e Waltman, 2010).

3.3 Mappatura scientifica

Un'altra tecnica ampiamente adottata nell'analisi bibliometrica è la mappatura scientifica, che consente al ricercatore di individuare i pattern nascosti nella struttura concettuale, sociale e intellettuale di un dato corpus di letteratura, e la loro evoluzione dinamica nel tempo (Borner *et al.*, 2003). La struttura concettuale si riferisce ai collegamenti che possono emergere tra diversi concetti o parole. La struttura sociale evidenzia le connessioni che si verificano tra le diverse unità di analisi, come autori, istituzioni e Paesi. La struttura intellettuale riguarda le relazioni tra diversi nodi (ad esempio, documenti, autori e riviste), che possono svelare le dinamiche evolutive di una disciplina.

Per catturare le strutture concettuali relative a diversity e inclusion è stata condotta un'analisi di co-occorrenza delle keyword, usando *Keywords Plus* come unità di analisi, ottenendo il network di 50 nodi illustrato in Fig. 3. Presentiamo inoltre l'evoluzione temporale dei principali temi presenti in letteratura (Cfr. Fig. 7), rappresentati poi in una matrice bidimensionale i cui assi sono funzioni di densità e centralità, per ognuno dei tre periodi presi in esame (Cfr. Fig. 8).

Riguardo la struttura sociale, è stata eseguita un'analisi di co-authorship (Cfr. Fig. 9). I raggruppamenti isolati e periferici non sono stati scartati per fornire una visione più completa del livello di collaborazione esistente tra studiosi in questo ambito.

Infine, per analizzare la struttura intellettuale dell'argomento, è stata utilizzata una storiografia (Garfield, 2004), tracciando l'evoluzione delle citazioni dei 20 documenti più influenti nel corso del tempo (Cfr. Fig. 10).

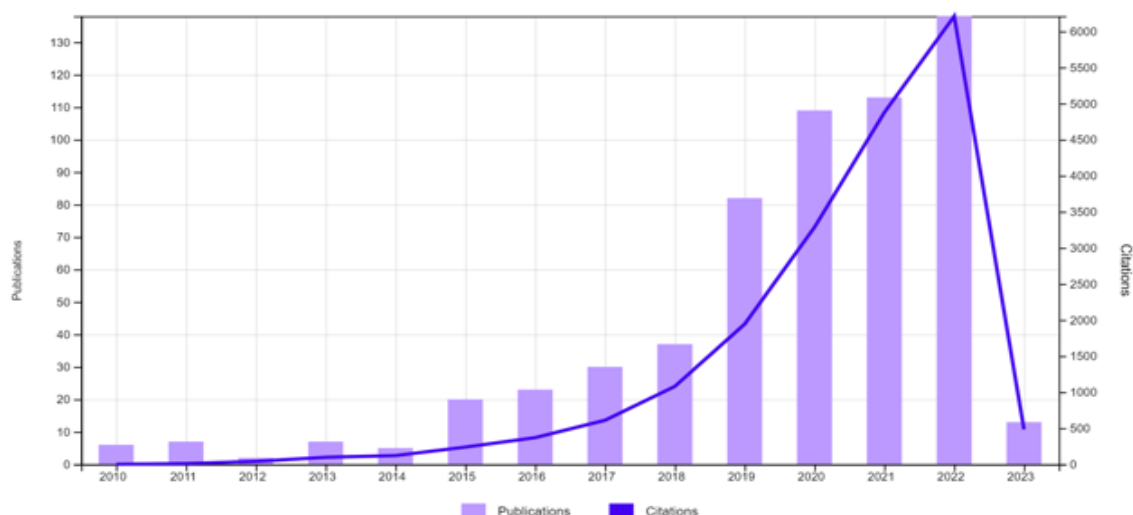
4. Risultati dell'analisi bibliometrica

4.1 Analisi delle performance

Nel grafico riportato in Fig. 1, è dato rilevare una forte attenzione della comunità scientifica verso i temi della diversity e della inclusione già a partire dal 2015, con livelli di crescita esponenziali negli anni a venire. Sicuramente la motivazione principale risiede nella introduzione della direttiva sulla Dichiarazione non Finanziaria (DNF) del 2014 che propose di modificare la normativa vigente a livello europeo in materia di contabilità, ponendosi come fine il miglioramento della trasparenza delle aziende corporate su questioni sociali, ambientali e di gestione. A rafforzare tali orientamenti nel 2015 le Nazioni Unite sottoscrissero l'Agenda 2030 con cui furono identificati i 17 obiettivi di sviluppo sostenibile, sottoscritti da 193 Stati⁶. Questi passaggi sicuramente hanno determinato una forte spinta verso i temi sociali favorendo una crescita significativa di lavori scientifici sulle tematiche oggetto del presente lavoro.

⁶ Sul tema si vedano anche i contributi Martinoli S., 2021

Fig. 1: Distribuzione nel tempo del numero di pubblicazioni e di citazioni per anno



Fonte: nostra elaborazione su dati WoS

Alla redazione dei contributi presenti nel sample hanno collaborato 1330 autori provenienti da 80 paesi e 778 diverse istituzioni (Cfr. Tab 1): a testimonianza dell'importanza della collaborazione tra autori come fattore critico per lo studio di questi temi, riportiamo che soltanto 119 contributi, circa il 20% del totale, sono a singola firma, mentre 147, circa un quarto del sample, sono scritti da due autori, e 326, più della metà, coinvolgono tre o più autori.

Tab. 1: Statistiche riepilogative

<i>Publications</i>	592
<i>Authors</i>	1330
<i>Sources</i>	191
<i>Institutions</i>	778
<i>Countries</i>	80
<i>Cited references</i>	19370

Fonte: nostra elaborazione su dati WoS

Passando all'analisi della rilevanza degli autori, si riportano misure sia quantitative che qualitative della performance dei singoli autori.

Dal punto di vista quantitativo la Tab. 2 riporta i 10 autori più prolifici del sample.

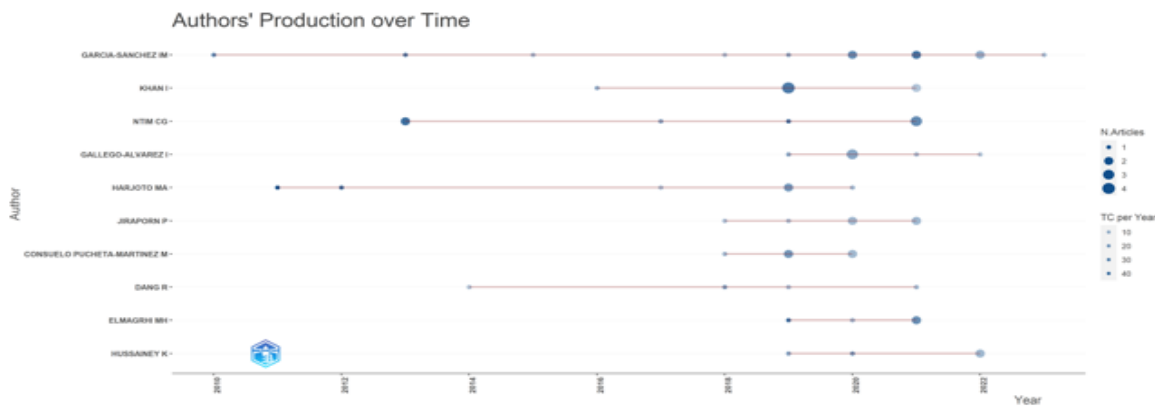
Tab. 2: Autori più prolifici (Top 10)

Authors	Record Count	% of 592
<i>Garcia-Sanchez IM</i>	16	2.703
<i>Martinez-Ferrero J</i>	12	2.027
<i>Pucheta-Martinez MC</i>	11	1.858
<i>Gallego-Alvarez I</i>	9	1.52
<i>Ntim CG</i>	8	1.351
<i>Hussainey K</i>	7	1.182
<i>Jiraporn P</i>	7	1.182
<i>Bel-oms I</i>	6	1.014
<i>Harjoto MA</i>	6	1.014
<i>Albitar K</i>	5	0.845
Showing 10 out of 1.330 entries		

Fonte: nostra elaborazione su dati WoS

Si nota subito che le tematiche trattate dai 10 autori più produttivi coincidono perfettamente con quelle del presente lavoro. In particolare, Garcia Sanchez e Martinez Ferrero hanno scritto insieme molti paper sul tema dell'inclusione e della gender diversity. Lo stesso dicasi per Pucheta Martinez e Gallego Alvarez che, insieme a Bel-Oms, hanno spesso analizzato problematiche relative alla gender diversity. Altri autori si sono occupati della CSR, focalizzandosi chi sulla CSR disclosure (Hussainey e Ntim), chi sul rapporto ESG disclosure e CSR (Albitar), chi sulla gender diversity o Board diversity e CSR (Harjoto, Jiraporn). Tutto ciò rileva anche - come d'altra parte si conferma nei risultati dell'analisi bibliometrica presentati nelle successive fig. 3-4 - come l'attenzione maggiore alle tematiche di CSR abbia indotto gli stessi autori ad interessarsi di più a problematiche correlate, quali la D&I. Dal punto di vista qualitativo, invece, la Fig. 2 denota la produzione scientifica nel tempo degli autori principali del campione preso in considerazione dalla presente review: è utile sottolineare che i nodi più grandi corrispondono ad una produttività maggiore dello specifico autore in quell'anno, mentre più il cerchio è scuro più citazioni ha ricevuto quell'autore per ogni anno dalla pubblicazione.

Fig. 2 - Produzione scientifica nel tempo dei top autori



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Dalla fig. 2 si evince come molti degli autori che manifestano maggiore continuità nel tempo in termini di produzione scientifica (Garcia Sanchez, Ntim, Harjoto, Dang e Khan) risultino essere anche i più prolifici ed i più citati. Questo è il segnale di una loro significativa autorevolezza, riconosciutagli in letteratura, rispetto alle tematiche trattate.

Delle 191 fonti scientifiche (journal) che popolano il nostro sample, riportiamo in Tab. 3 le 10 più rilevanti in termini di produttività.

Tab. 3: Fonti più prolifiche (Top 10)

Publication Titles	Record Count	% of 592
<i>CORPORATE SOCIAL RESPONSIBILITY AND ENVIRONMENTAL MANAGEMENT</i>	66	11.149
<i>JOURNAL OF BUSINESS ETHICS</i>	39	6.588
<i>BUSINESS STRATEGY AND THE ENVIRONMENT</i>	32	5.405
<i>CORPORATE GOVERNANCE THE INTERNATIONAL JOURNAL OF BUSINESS IN SOCIETY</i>	28	4.73
<i>SOCIAL RESPONSIBILITY JOURNAL</i>	17	2.872
<i>JOURNAL OF MANAGEMENT GOVERNANCE</i>	12	2.027
<i>MEDITARI ACCOUNTANCY RESEARCH</i>	12	2.027
<i>COGENT BUSINESS MANAGEMENT</i>	11	1.858
<i>INTERNATIONAL JOURNAL OF ACCOUNTING AND INFORMATION MANAGEMENT</i>	11	1.858
<i>CORPORATE GOVERNANCE AN INTERNATIONAL REVIEW</i>	10	1.689
Showing 10 out of 191 entries		

Fonte: nostra elaborazione su dati WoS

Dalla Tab. 3 si evince, in particolare, che le maggiori riviste che si occupano di tematiche riguardanti la CSR e l'etica d'impresa sono anche quelle che presentano più pubblicazioni sui temi della D&I. Ciò a conferma dell'interesse sempre più crescente, nella letteratura inerente la corporate governance, per gli aspetti dell'inclusione e della diversità.

Le Tab. 4 e 5 infine presentano rispettivamente le 10 istituzioni e i 10 paesi più prolifici sui temi della diversità e dell'inclusione.

Tab. 4 - Istituzioni più prolifiche (Top 10)

Affiliations	Record Count	% of 592
UNIVERSITY OF SALAMANCA	28	4.73
UNIVERSITÉ DE SFAX	15	2.534
EGYPTIAN KNOWLEDGE BANK EKB	13	2.196
UNIVERSITY OF PORTSMOUTH	13	2.196
COMSATS UNIVERSITY ISLAMABAD CUI	12	2.027
UNIVERSITAT JAUME I	12	2.027
UNIVERSITY OF SOUTHAMPTON	12	2.027
UNIVERSITY OF VALENCIA	11	1.858
UNIVERSITÀ DELLA CAMPANIA VANVITELLI	10	1.689
DONGBEI UNIVERSITY OF FINANCE ECONOMICS	9	1.52
Showing 10 out of 778 entries		
1 record(s) (0.169%) do not contain data in the field being analyzed		

Fonte: nostra elaborazione su dati WoS

Nella Tab. 4 si nota come le principali istituzioni accademiche che si occupano di D&I non rappresentino più del 22-23% di tutte le pubblicazioni sull'argomento. Si tratta di un dato a nostro parere molto interessante, poiché dimostra che, a livello internazionale, le pubblicazioni inerenti tali tematiche sono diffuse in maniera capillare, il che denota, quindi, un notevole indice di pluralismo tematico. In altre parole, l'argomento D&I non può essere considerato in alcun modo una tematica di nicchia, limitata a poche istituzioni, ma è, invece, territorialmente diffuso ovunque, anche se con qualche picco di interesse riguardante alcune istituzioni più di altre.

Tab. 5 - Paesi più prolifici (Top 10)

Countries/Regions	Record Count	% of 592
USA	93	15.709
ENGLAND	77	13.007
SPAIN	77	13.007
ITALY	57	9.628
CHINA	57	9.628
AUSTRALIA	53	8.953
FRANCE	36	6.081
CANADA	33	5.574
MALAYSIA	29	4.899
TUNISIA	26	4.392
Showing 10 out of 80 entries		
1 record(s) (0.169%) do not contain data in the field being analyzed		

Fonte: nostra elaborazione su dati WoS

Dalla Tab. 5 si evince che la maggior parte degli autori che si occupano di D&I proviene da paesi anglosassoni (USA, Gran Bretagna, Australia e Canada) e latini (Italia, Spagna, Francia).

In coda alla sezione sull'analisi delle performance prendiamo in esame i 10 paper più influenti del sample, classificati per numero di citazioni normalizzate (Cfr. Tab. 6), che è una misura dell'impatto del singolo paper derivata dall'analisi secondaria effettuata con VOSviewer.

Tab. 6 - Articoli più influenti per citazioni normalizzate (Top 10)

Authors	Title	Source	Pub. year	Norm. Citations	url
beji, rania; yousfi, ouidad; loukil, nadia; omri, abdelwahed	<i>board diversity and corporate social responsibility: empirical evidence from france</i>	journal of business ethics	2021	73.278	https://doi.org/10.1007/s10551-020-04522-4
buallay, amina; hamdan, reem; barone, elisabetta; hamdan, allam	<i>increasing female participation on boards: effects on sustainability reporting</i>	international journal of finance & economics	2022	5.673	https://doi.org/10.1002/ijfe.2141
liao, lin; luo, le; tang, qingliang	<i>gender diversity, board independence, environmental committee and greenhouse gas disclosure</i>	british accounting review	2015	56.694	https://doi.org/10.1016/j.bar.2014.01.002
baker, h. kent; pandey, nitesh; kumar, satish; haldar, arunima	<i>a bibliometric analysis of board diversity: current status, development, and future research directions</i>	journal of business research	2020	52.504	https://doi.org/10.1016/j.jbusres.2019.11.025
elmagrhi, mohamed h.; ntim, collins g.; elamer, ahmed a.; zhang, qingjing	<i>a study of environmental policies and regulations, governance structures, and environmental performance: the role of female directors</i>	business strategy and the environment	2019	52.069	https://doi.org/10.1002/bse.2250
nguyen, thi h. h.; elmagrhi, mohamed h.; ntim, collins g.; wu, yue	<i>environmental performance, sustainability, governance and financial performance: evidence from heavily polluting industries in china</i>	business strategy and the environment	2021	50.332	https://doi.org/10.1002/bse.2748
mcguinness, paul b.; vieito, joao paulo; wang, mingzhu	<i>the role of board gender and foreign ownership in the csr performance of chinese listed firms</i>	journal of corporate finance	2017	49.863	https://doi.org/10.1016/j.jcorpfin.2016.11.001
khatib, saleh f. a.; abdullah, dewi fariha; elamer, ahmed a.; abueid, raed	<i>nudging toward diversity in the boardroom: a systematic literature review of board diversity of financial institutions</i>	business strategy and the environment	2021	46.631	https://doi.org/10.1002/bse.2665
garcia-sanchez, isabel-maria; hussain, nazim; khan, sana-akbar; martinez-ferrero, jennifer	<i>assurance of corporate social responsibility reports: examining the role of internal and external corporate governance mechanisms</i>	corporate social responsibility and environmental management	2022	45.924	https://doi.org/10.1002/csr.2186
songini, lucrezia; pistonni, anna; tettamanzi, patrizia; fratini, fabrizio; minutiello, valentina	<i>integrated reporting quality and bod characteristics: an empirical analysis</i>	journal of management & governance	2022	45.924	https://doi.org/10.1007/s10997-021-09568-8

Fonte: nostra elaborazione su dati WoS e VOSviewer

Più in dettaglio, dall'analisi dei paper predetti e dagli studi bibliometrici sul tema della diversità del Cda (Baker *et al.*, 2020), pur nella varietà degli approcci teorico-metodologici ed empirici, emerge con chiarezza che la ricerca si concentra prevalentemente sulla diversità di genere con un'attenzione relativamente minore, e solo in tempi più recenti, a fattori quali età, nazionalità, etnia, background professionale e profili cognitivo comportamentali. In particolare provando a tratteggiare a grandi linee le tendenze maggiormente ricorrenti, nei paper maggiormente citati, emergono tre macro-filoni: i) il tema dell'influenza della diversità nel Cda sulla governance aziendale (Garcia-Sanchez *et al.*, 2021) e su accountability di policy e performance (Elmagrhi *et al.*, 2019; Songini *et al.*, 2018); ii) lo studio dei fattori che influenzano la diversità nel consiglio di amministrazione (Liao *et al.*, 2015); iii) l'analisi delle modalità attraverso le quali la diversità del Cda influisce sulla politica aziendale in materia di responsabilità sociale d'impresa (McGuinness *et al.*, 2017) e sui cambiamenti nella strategia aziendale.

4.2 Mappatura scientifica

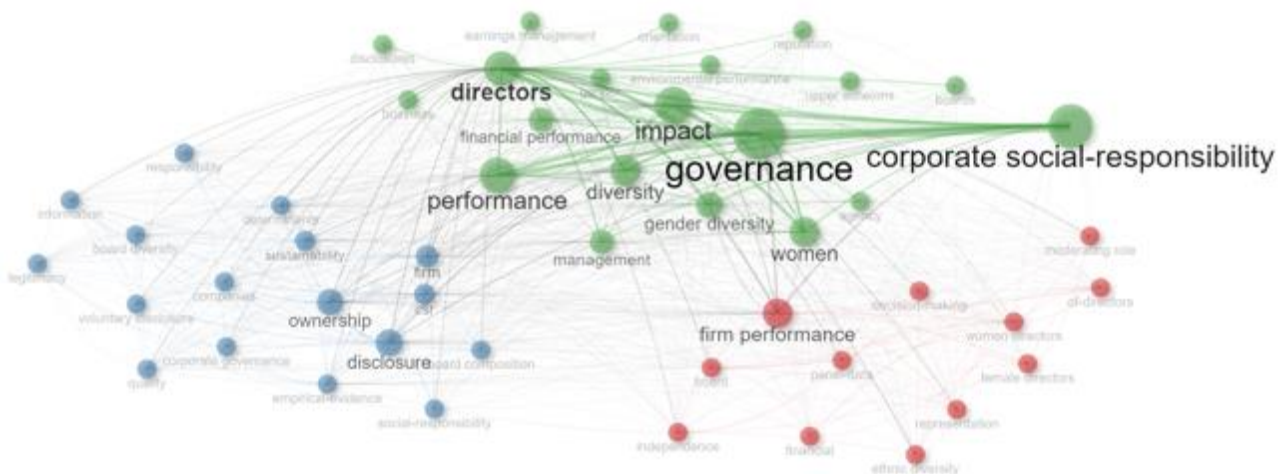
Per completare l'analisi bibliometrica sui temi della diversità e dell'inclusione, in questa sezione vengono forniti i risultati della mappatura scientifica, che identifica le strutture concettuali, intellettuali e sociali del tema sotto indagine.

4.2.1 Struttura concettuale

L'analisi della struttura concettuale consente di evidenziare le connessioni esistenti tra keyword, permettendo l'individuazione dei macro-temi e dei principali filoni di letteratura. Nel presente lavoro si è deciso di rappresentare le co-occorrenze tra le 50 *Keywords Plus* maggiormente ricorrenti nelle pubblicazioni presenti nel sample, come esplicitato dal network in Fig. 3. In un network di questo tipo più le keyword vengono usate insieme dagli autori, più appaiono vicine tra loro, formando archi più brevi e robusti. La grandezza dei nodi, inoltre, rappresenta l'occorrenza semplice della singola parola chiave: più è grande più quella keyword è utilizzata dagli autori del sample, a prescindere dal rapporto di co-occorrenza che la lega alle altre keyword. I colori, infine, denotano i differenti cluster tematici. Nel caso di specie si sono delineati tre macro-temi:

- Il ruolo di moderazione della presenza femminile nel *Board of Directors (BoD)* sulle performance aziendali - **Cluster rosso**;
- L'impatto che le spinte verso la *Corporate Social Responsibility (CSR)* e verso la sostenibilità anche in termini di gender diversity esercitano nei confronti della governance aziendale - **Cluster verde**;
- Il ruolo della disclosure sulle componenti di sostenibilità e diversità di un'impresa - **Cluster blu**;

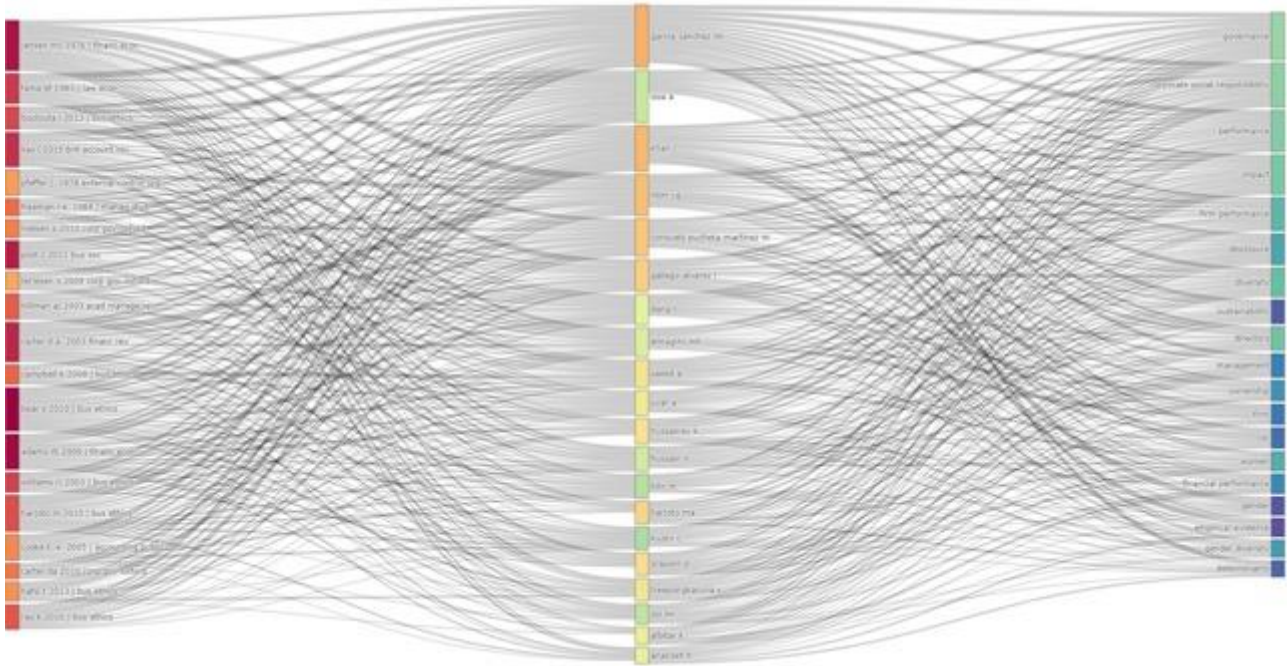
Fig. 3: Network di co-occorrenza delle keyword



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Al fine di fornire una visione più completa della struttura concettuale dei lavori che insistono su diversità e inclusione in ambito manageriale, in Fig. 4 riportiamo il diagramma di Sankey (Riehmman *et al.*, 2005) che lega i riferimenti più citati (anche e soprattutto quelli esterni al cluster e anteriori all'epoca di pubblicazione dei lavori analizzati), agli autori più influenti del cluster e questi a loro volta ai filoni tematici più rilevanti. Una visualizzazione di questo tipo è molto potente, poiché lega i contributi più autorevoli della letteratura di riferimento ai principali autori del sample, che ispirati dal contributo dei primi producono nuova letteratura scientifica che insiste sui temi più rilevanti in ambito di governance sostenibile e diversity.

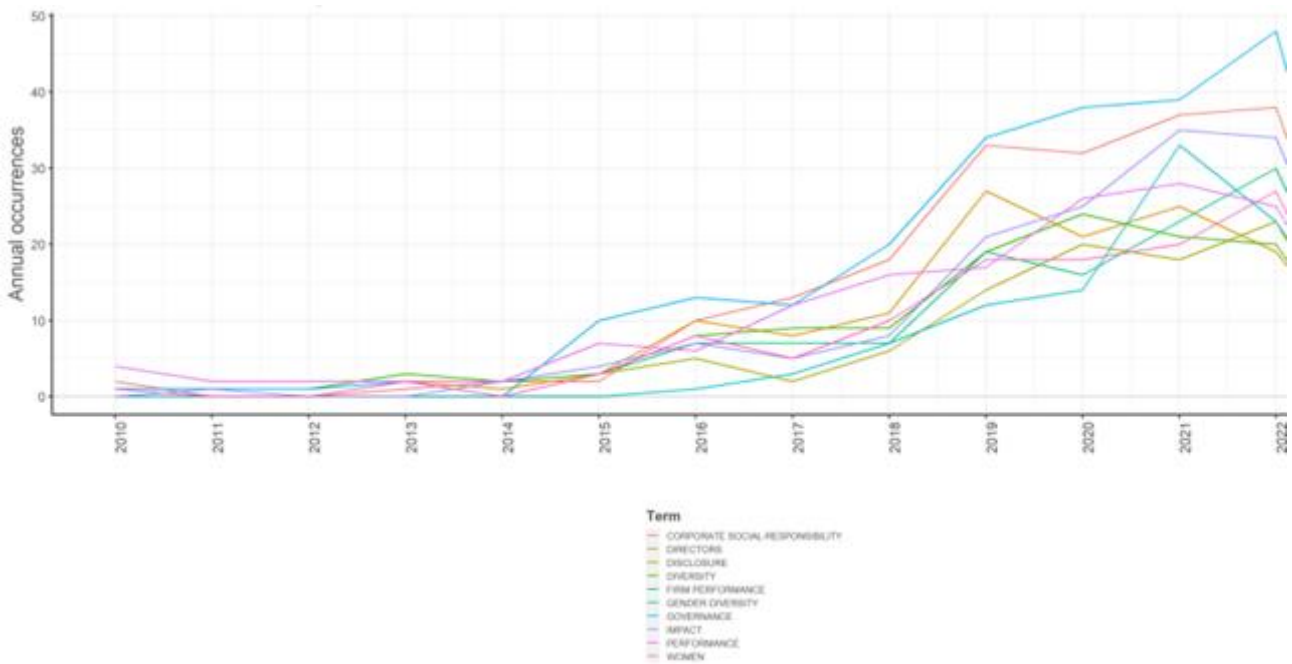
Fig. 4: Diagramma di Sankey (Top Cited References -> Top Authors -> Top Themes)



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Con l'intento di offrire, inoltre, una prospettiva sui trend che hanno interessato negli anni i filoni tematici principali e secondari, riportiamo in Fig. 5 il grafico della frequenza anno per anno delle keyword più rilevanti: si rileva, ad esempio, che temi quali “*diversity*”, “*gender diversity*” e “*corporate social responsibility*” siano sempre più caldeggiati dagli autori del sample, mostrando un evidente incremento nella frequenza di utilizzo a partire dal 2018, fino a raggiungere un picco rilevante nel 2022.

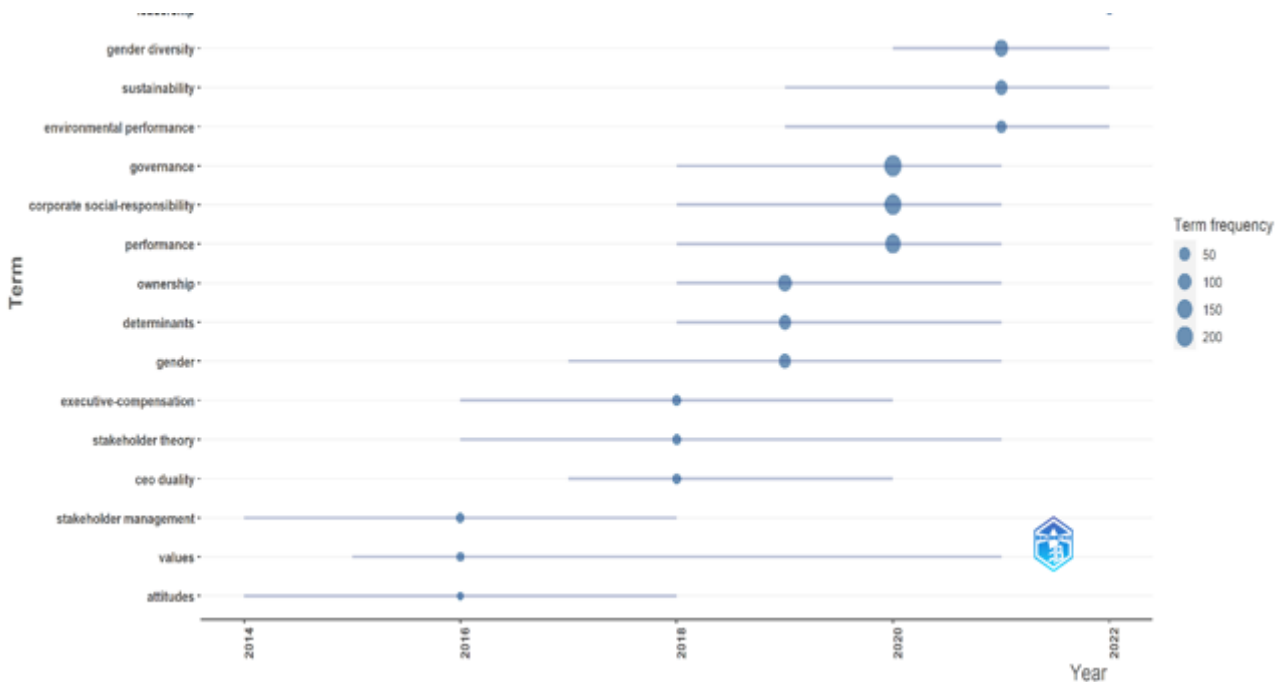
Fig. 5: Words' frequency over time



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Nella successiva Fig. 6 tale trend è ancora più evidente e indica chiaramente come alcuni argomenti (“attitudes”, “stakeholders management”, “Ceo duality”, et cetera) abbiano perso d’interesse e risultino sempre meno studiati e/o citati in letteratura, laddove, invece, argomenti come “gender diversity”, “sustainability”, “environmental performance”, siano, al contrario, sempre più d’attualità dal 2018 in poi, confermando l’importanza delle tematiche riguardanti l’inclusione e la diversità nelle imprese, che appaiono sempre più dibattute e discusse in letteratura.

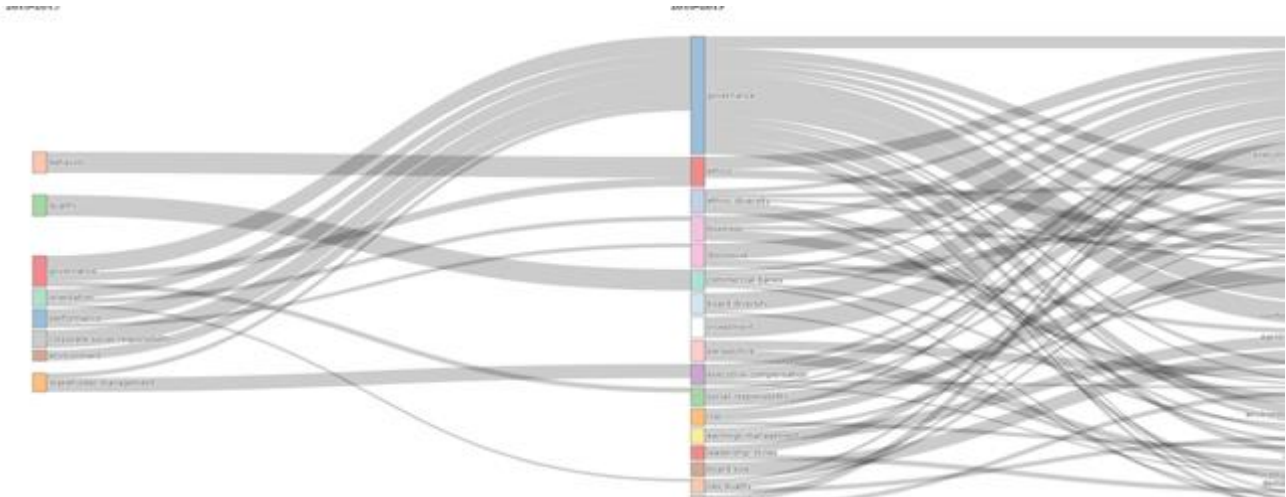
Fig. 6: Trend Topics



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Infine, è ancor più interessante notare come, nel periodo di tempo considerato (2010-2022), le tematiche che si riferiscono alla diversità sono state sempre meno citate nell’ambito di pubblicazioni riguardanti specificamente la diversità e l’inclusione e sempre più citate, invece, in pubblicazioni aventi ad oggetto tematiche più generali di corporate governance. Ad esempio, nella Fig. 7 si evidenzia come tematiche quali l’ethnic diversity o la board diversity siano sempre meno riconducibili a paper focalizzati sulla demographic diversity e trovino, invece, sempre più spazio, dal 2016 in poi, in paper focalizzati su tematiche più propriamente specializzate nella governance. Questa è la dimostrazione che la letteratura accoglie sempre di più queste tematiche di diversity e inclusion nell’ambito del management e della corporate governance, anche in chiave ESG.

Fig. 7: Evoluzione dell'interesse in letteratura per i temi di diversità ed inclusione



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Un'ulteriore e più raffinata analisi, in coerenza con la precedente, rileva come, nell'ambito dei tre periodi di analisi considerati (2010-2015; 2016-2019; 2020-2022), specifiche tematiche riguardanti la diversità e l'inclusione siano emerse e poi declinate a vantaggio di altre. La rappresentazione in Fig. 8, infatti, esplicita in maniera efficace i principi della mappatura tematica della letteratura. Le mappe tematiche sono molto intuitive e permettono ai ricercatori di analizzare l'evoluzione dei filoni nei quattro diversi quadranti (Cobo *et al.*, 2011), individuati in base alla loro centralità (tracciata sull'asse delle X) e densità (tracciata sull'asse Y). Più precisamente, la centralità misura il livello in cui un argomento è collegato ad altri argomenti di cluster tematici differenti e, a sua volta, significativo in un dominio specifico. La densità, d'altra parte misura la forza con cui le parole chiave in un determinato cluster sono collegate tra loro e quindi il grado di sviluppo di un tema. In questo senso, *il quadrante in alto a destra* contiene temi con elevata centralità e densità (*Motor Themes*), in grado di influenzare la ricerca esterna al cluster e ben sviluppati anche internamente. *Il quadrante in basso a destra* mostra temi trasversali a una disciplina (*Basic Themes*), in grado di influenzare altri argomenti, poiché hanno un'alta centralità, ma debolmente consolidati internamente per via della bassa densità. *Il quadrante in basso a sinistra* evidenzia gli argomenti che stanno emergendo o scomparendo (*Emerging or Declining Themes*), poiché hanno bassa centralità e densità. Infine, *il quadrante in alto a sinistra* include temi di nicchia tra gli studiosi (*Niche Themes*), che sono ben sviluppati internamente, in virtù dell'alta densità, ma non sono in grado di influenzare altri temi a causa della bassa centralità.

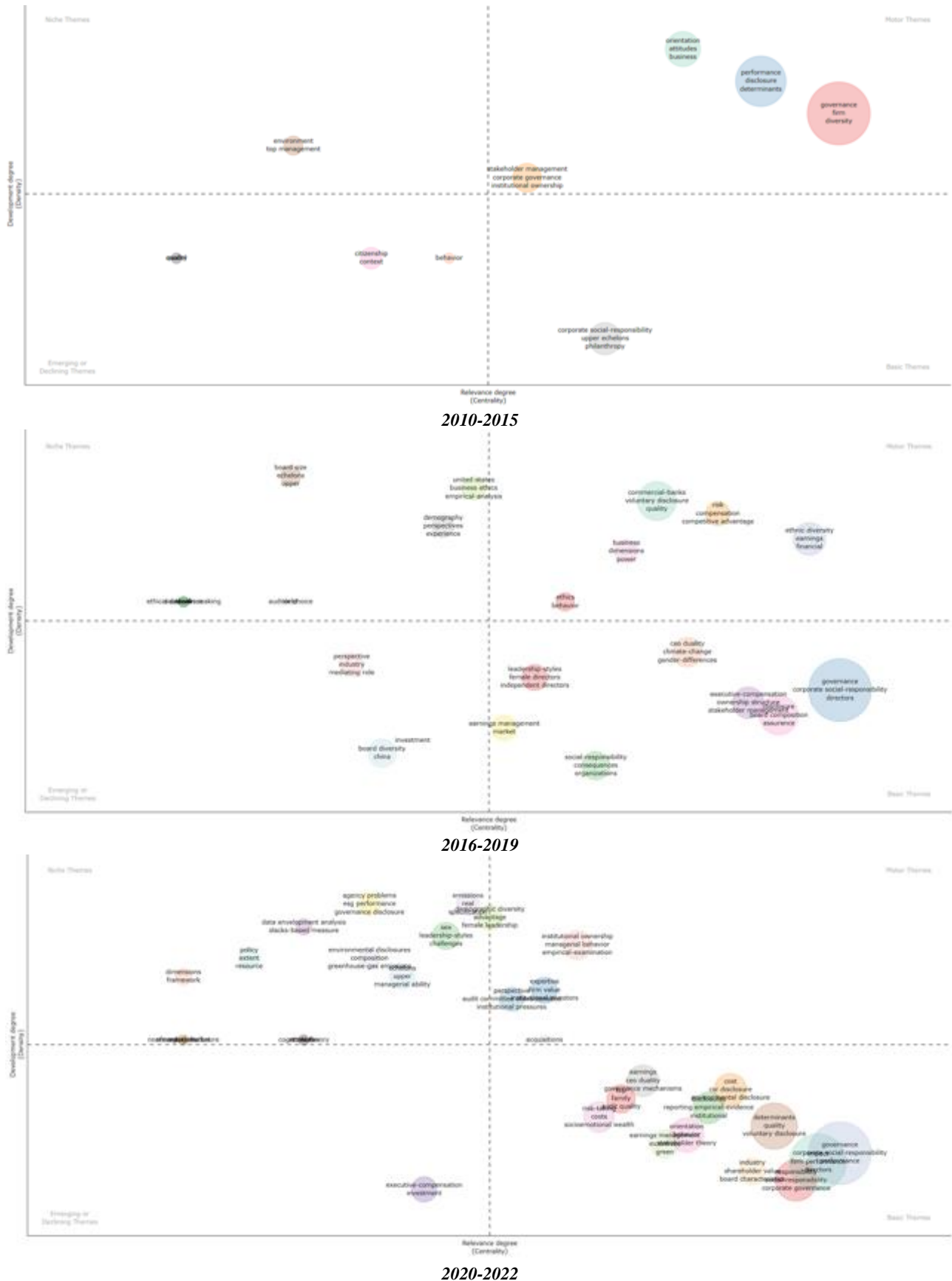
Dalla Fig. 8, che fotografa i tre periodi e considera, come già ribadito, il rapporto tra sviluppo e rilevanza di un argomento nella letteratura considerata, si rilevano dei sostanziali cambiamenti nel posizionamento della letteratura che insiste su diversity e inclusione rispetto ai principali filoni, con l'attenzione dei ricercatori che si muove gradualmente nel tempo da macro-temi a carattere generalista a sotto-temi più specifici e dai contorni meno sfumati. Più in particolare sembrano emergere alcune importanti considerazioni:

- un forte aumento dei temi di nicchia con la comparsa di topics quali quelli connessi alle ESG performance, all'environmental disclosure composition, leadership femminile e la diversità demografica;
- una elevata numerosità dei temi trasversali in grado di influenzare altri argomenti tra i quali si segnala: voluntary disclosure; CSR disclosure; risk taking e tematiche connesse alla Social emotional wealth theory
- una sensibile concentrazione su pochi temi trainanti fortemente concentrati sull'istituzionale ownership e managerial behavior

In estrema sintesi sembra emergere una maggiore consapevolezza delle tematiche della diversity and inclusion maggiormente focalizzati sulla ridefinizione del concetto di proprietà e di comportamento imprenditoriale. Lungo tale nuova direttrice le tematiche oggetto della review

sembrano più concentrate sulla ricerca di nuovi sistemi di misurazione alla ricerca spasmodica di un nuovi meccanismi regolatori.

Fig. 8: Mappe tematiche dei tre periodi considerati



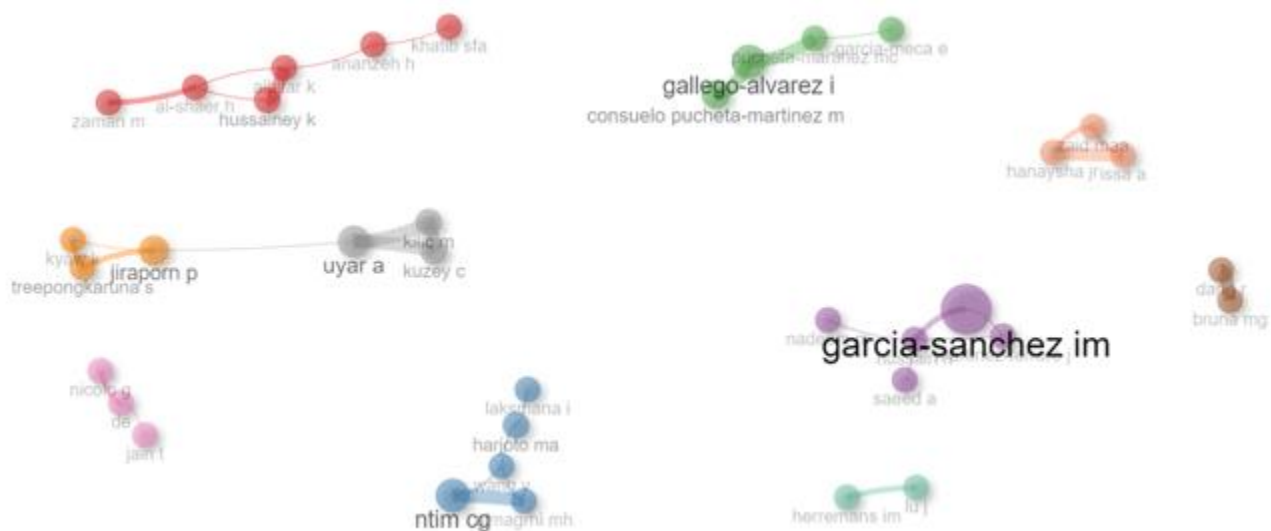
Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

4.2.2. Struttura sociale e intellettuale

In maniera del tutto simile all'analisi della struttura concettuale, è possibile applicare i principi della co-occorrenza allo studio della struttura sociale, costruendo, come in Fig. 9, un network collaborativo basato sulla co-authorship, svelando le connessioni tra studiosi che si interessano di diversity e inclusion in ambito business. I nodi più grandi rappresentano gli autori più prolifici e le coppie di autori che collaborano più spesso sono posizionate in nodi più vicini connessi da archi più spessi.

A tal proposito, come si è commentato nella tab. 2, si rileva, almeno relativamente ai 10 autori più prolifici, che 7 su 10 lavorano insieme: Garcia Sanchez e Martinez Ferrero; Pucheta Martínez, Gallego Alvarez e Bel-Oms; Hussainey e Ntim. Queste cooperazioni riguardano specifici argomenti, da cui si potrebbe presumere l'esistenza di una sorta di scuola tematicamente specializzata. Non vi sono, infatti, dati sufficienti per poterlo affermare cosicché, anche in questo caso, si rimanda la verifica di tale ipotesi a future ricerche.

Fig. 9 - Network collaborativo tra autori (Co-authorship)



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Infine, per ricostruire la struttura intellettuale delle pubblicazioni relative a diversity e inclusion è stata sviluppata la storiografia rappresentata in Fig. 10. In questo tipo di visualizzazioni l'unità di analisi è la co-citazione, che misura il numero di volte che i paper rappresentati dai nodi del network in figura sono stati citati insieme da altri documenti presenti nel sample. In questo modo è possibile storicizzare l'impatto dei contributi più rilevanti, collocandoli sequenzialmente nel tempo e rilevandone le connessioni intertemporali. Mentre è normale, per l'impostazione metodologica dell'analisi storiografica, che i 10 contributi più citati a livello locale dagli autori del sample (Cfr. Fig. 11) sebbene siano tutti presenti nel network, appare notevole che dei 10 paper più influenti a livello globale per numero di citazioni assolute ben 8 siano presenti nella storiografia in Fig. 10. In altri termini, questi 8 contributi dimostrano non solo rilevanza interna, ma anche esterna al sample. Questo porta a due considerazioni: i) i paper considerati storicamente più influenti dagli autori del sample di riferimento, su cui si è basata la produzione scientifica più recente, sono considerati di alta rilevanza anche al di fuori della letteratura che insiste specificamente su Diversity e Inclusion; ii) la rilevanza esterna dei lavori presenti nel network storiografico conferma la solidità delle fondamenta della letteratura sotto indagine, e consente con ogni evidenza di individuare dei capostipiti, che hanno ispirato i contributi successivi. Appare inoltre interessante notare che ben 3 dei 10 paper più influenti per numero di citazioni normalizzate (Liao *et al.*, 2015; McGuinness *et al.*, 2017; Beji *et al.*, 2021), di cui si è già discusso, siano anche parte del network storiografico,

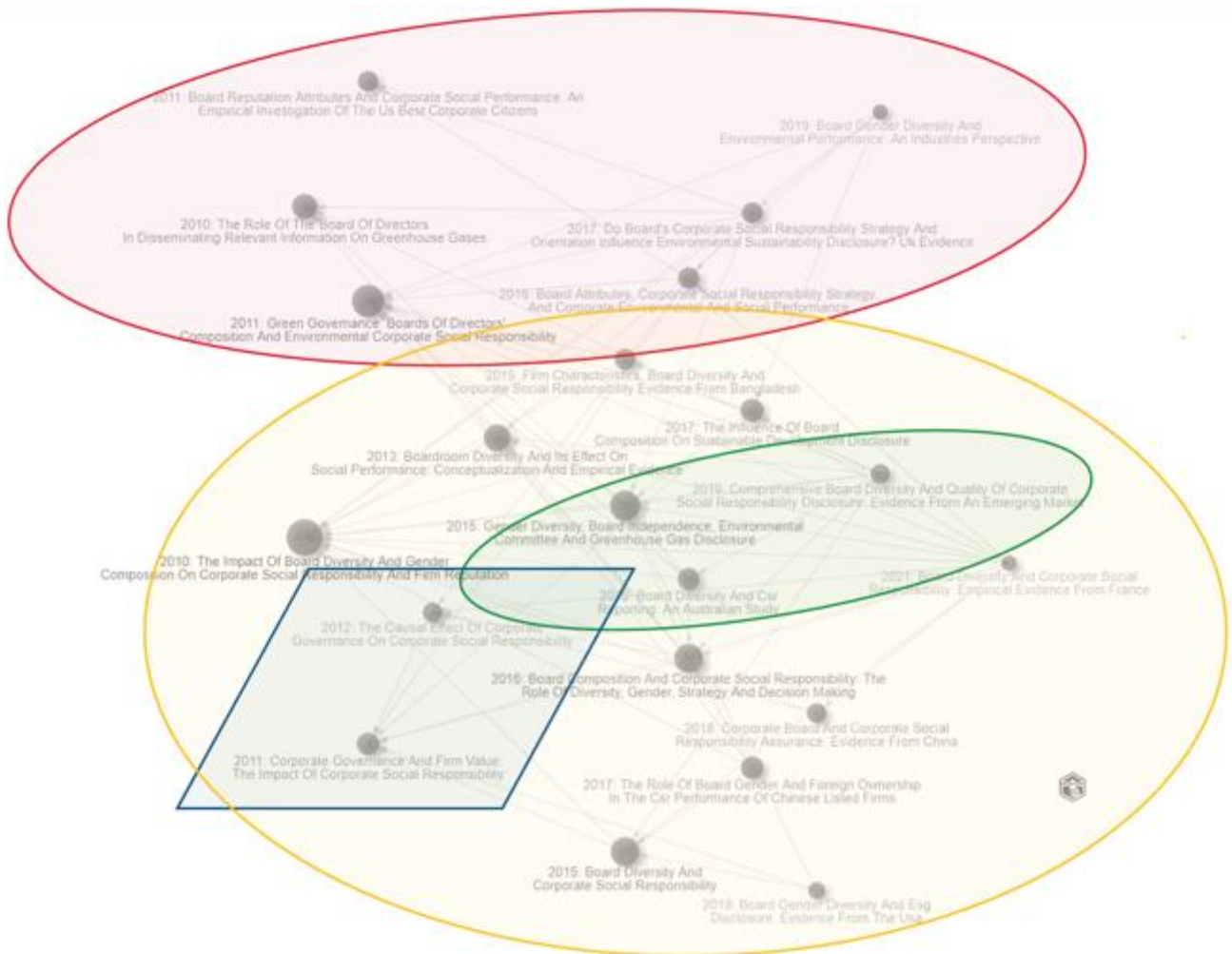
nonostante siano relativamente recenti.

Passando infine all'analisi del network vero e proprio, sebbene a prima vista il tracciato storiografico appaia intricato, a ben vedere moltissimi paper recenti (sulla destra) sono riconducibili a radici comuni. I contributi più riconoscibili in tal senso sono: i) Post *et al.* (2011); ii) Liao *et al.* (2015); iii) Jo e Harjoto (2011); iv) Bear *et al.* (2010), che è peraltro il paper con il più alto numero di citazioni assolute, sia locali (217) che globali (844). I quattro lavori capostipite individuano altrettanti cluster tematici, che presentano un certo grado di sovrapposizione coi cluster evidenziati dall'analisi della co-occorrenza delle keywords. I paper, nei rispettivi cluster, indagano:

- ispirandosi a Post *et al.* (2011), il ruolo che la diversità in termini di BoD esercita rispetto alle performance più spiccatamente ambientali delle imprese - Cluster rosso;
- ispirandosi a Liao *et al.* (2015), l'influenza esercitata dalla diversità di genere sulla Disclosure Non Finanziaria - Cluster verde;
- ispirandosi a Jo e Harjoto (2011), l'effetto esercitato dalle scelte strategiche di CSR da parte delle imprese sul valore societario - Cluster blu;
- ispirandosi a Bear *et al.* (2010), la più generale influenza della diversità sulle politiche di CSR - Cluster giallo.

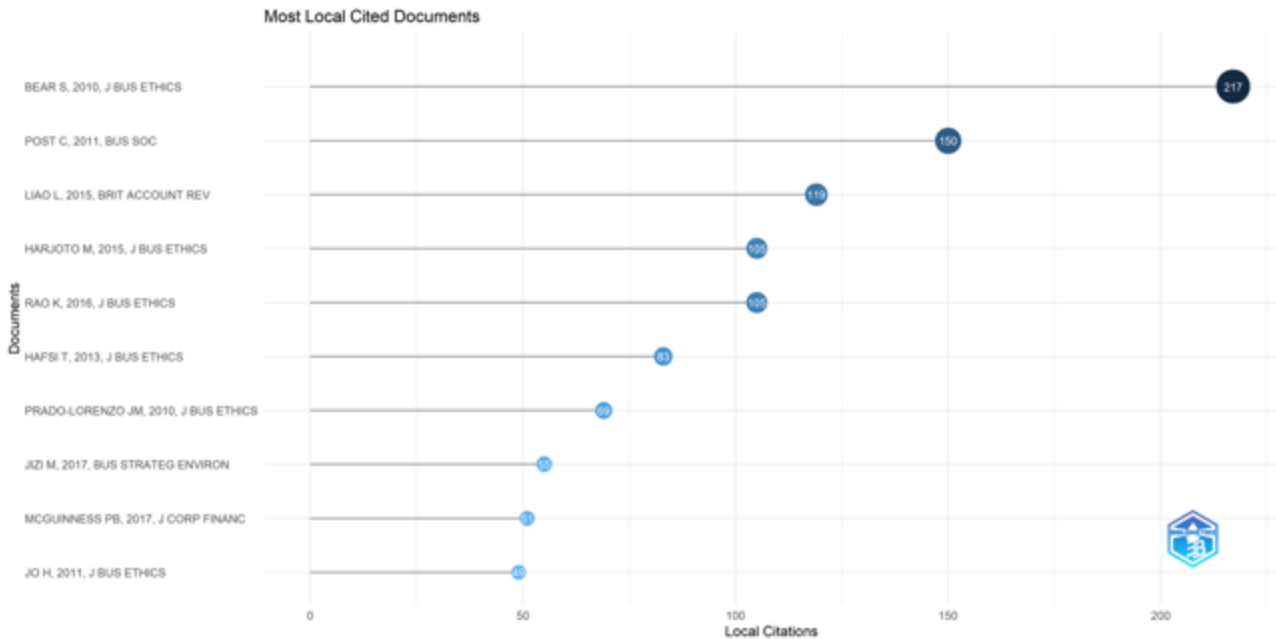
È necessario sottolineare tuttavia che non ha senso immaginare questi cluster come partizioni a tenuta stagna, posto che, sebbene i quattro lavori capostipite abbiano generalmente ispirato con maggior forza i contributi interni, presentano, come visibile in Fig. 10, anche molte frecce entranti provenienti da nodi esterni al cluster di appartenenza.

Fig. 10: Storiografia



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

Fig. 11: Paper più citati a livello locale nel sample



Fonte: elaborazione con Bibliometrix su dati WoS. Visualizzazione con Biblioshiny.

5. Discussione e conclusione

Nell'ultimo decennio il dibattito scientifico intorno ai macro-temi della diversità e dell'inclusione in ambito organizzativo ha assunto un carattere di estrema vivacità e pluralità in termini sia di innalzamento della prolificità degli output di ricerca pubblicati sull'argomento, che di arricchimento e complessificazione della visione dei ricercatori e delle aziende stesse nei confronti di tali temi. Ciò potrebbe essere dovuto agli interventi regolatori dei policymaker, come ad esempio quello europeo, che con l'emanazione della Direttiva 2014/95/EU ha disposto l'obbligo per le grandi società quotate, le banche e le compagnie di assicurazione ("enti di interesse pubblico") con più di 500 dipendenti di pubblicare rapporti sulle politiche che attuano in materia di: i) responsabilità sociale e trattamento dei dipendenti; ii) rispetto dei diritti umani; iii) anticorruzione; iv) diversità nei consigli di amministrazione delle società (in termini di età, sesso, background educativo e professionale) (Hahnkamper-Vandenbulcke, 2021). Questo, pur rappresentando un importante vincolo in termini di compliance per le realtà organizzative, ha spianato la strada ai ricercatori, che hanno così ottenuto accesso diretto ad una mole di dati significativa sul comportamento sostenibile, anche in termini di diversity, di tali imprese.

In questo contesto di vivace complessità si incardina il presente lavoro, che in un intento di sistematizzazione tematico-concettuale degli argomenti sotto indagine evidenzia i filoni e i sotto-temi legati a diversity e inclusione maggiormente caldeggiati dai ricercatori, adottando come knowledge base un sample di 592 paper indicizzati su WoS pubblicati dal 2010 al 2023.

Sul fronte dell'analisi delle performance la presente review delinea un panorama variegato in termini di paesi, istituzioni, e ricercatori coinvolti nel dibattito su diversità e inclusione. In questo senso la diversità culturale dei ricercatori e del contesto sociale in cui operano le aziende offrono un interessante spunto per future ricerche, che potrebbero indagare come tali fattori influiscono sulla concezione di diversità e inclusione.

L'analisi delle performance, pur non ignorando la complessità sinora descritta, non manca tuttavia di mettere in evidenza gli autori più influenti e i contributi più significativi al dibattito scientifico sul tema. Emerge chiaramente dalla discussione sui contributi degli autori più importanti il legame che intercorre tra le tematiche di CSR e quelle legate alla diversity, con un sempre più

rilevante interessamento agli aspetti etici. Sul punto tali considerazioni ci appaiono da subito fortemente allineate ai dati forniti dal Welfare Index Pmi 2022, che dimostrano un impatto positivo delle politiche di inclusione anche sulla produttività: nell'anno 2021, infatti, l'utile delle Pmi con livello di welfare ed inclusione elevato (6,7%) è risultato doppio rispetto a quelle con welfare a un livello base (3,7%).

Il maggiore contributo del presente lavoro è però la mappatura scientifica dei temi affrontati dalla letteratura di management in relazione alla diversity, all'inclusione, e più in generale all'agire imprenditoriale socialmente sostenibile. La mappa tematica ben descrive l'evoluzione del field a partire dal 2010, cristallizzando l'attenzione su tre distinti periodi: i) 2010-2015; ii) 2016-2019; iii) 2020-2022. Le spinte di cambiamento più significative si possono osservare in merito all'aumentata complessità, viepiù negli ultimi anni, del concetto di diversity: nel periodo 2010-2015, infatti, diversità ed inclusione emergevano nella letteratura soprattutto in associazione alle più generali tematiche di governance. Tale accezione sfuma gradualmente nel tempo, fino ai giorni nostri, per essere declinata in sotto-temi concettualmente più articolati e specifici, come la "ethnic diversity" e la "demographic diversity". In altri termini, la letteratura affronta le tematiche di diversity dapprima con piglio generalista, per poi aprirsi negli anni successivi a ramificazioni ed interpretazioni più complesse, con la diversity che dà origine per gemmazione a nuovi temi di nicchia, come la leadership femminile e la diversità demografica, che stanno per assumere un ruolo trainante nel dibattito scientifico. Col trascorrere degli anni si assiste anche alla trasformazione della postura della letteratura nei confronti del tema del comportamento manageriale in ambito di diversità e inclusione, che da emergente diviene via via sempre più trainante, intrecciandosi, come peraltro precedentemente già rilevato, a questioni che tendono a ridefinire il ruolo della proprietà e del comportamento manageriale che in alcuni casi sfocia con l'utilizzo dei concetti di etica d'impresa ed umanesimo imprenditoriale. Questo risultato stimola la riflessione, nonché future ricerche in questa direzione, aprendo interessanti riflessioni sul rapporto tra shareholderismo e stakeholderismo, ovvero sul ruolo dell'azionista e sul comportamento manageriale, nonché su quanto tali tematiche siano in grado di influenzare la diversity, o se di converso sia proprio la diversity a ingenerare un cambiamento nelle organizzazioni che le orienti verso un agire d'impresa maggiormente votato a comportamenti sostenibili e più equilibrati tra gli attori in gioco. A livello più generale poi si evidenzia una tendenza a coniugare negli ultimi anni i temi della governance e della CSR: mentre fino al 2015 quello della governance era considerato un tema trainante apparentemente slegato dalla CSR, nei periodi successivi le due tematiche entrano a far parte dello stesso raggruppamento logico e divengono entrambe di base, trasversali alla letteratura e con un alto grado di rilevanza. Parimenti interessanti sono infine le considerazioni intorno ai temi della disclosure: mentre fino al 2015 la disclosure rientrava nei *Motor Themes* in associazione con la performance aziendale, dal 2016 al 2019 la letteratura è andata consolidandosi, considerando sempre più quello della disclosure un tema trasversale. C'è da notare inoltre che in quel periodo mentre il dibattito sulla disclosure sic et simpliciter ha assunto caratteri di generalizzabilità, emerge come nuovo tema trainante la voluntary disclosure, segnale che qualcosa stava iniziando a cambiare nella sensibilità dei ricercatori e del mercato riguardo la sostenibilità, anche sociale, dell'agire d'impresa. Questo trend è confermato dal comportamento della CSR, che da tema di base scarsamente sviluppato e solo mediamente rilevante nel primo periodo consolida fortemente la propria posizione con un'accresciuta rilevanza ed un discreto aumento del grado di sviluppo. Nel periodo post-pandemico poi, il dibattito scientifico intorno alla disclosure si è arricchito di ulteriori sfumature di significato, con la voluntary disclosure che è divenuta un tema di base che lascia il passo all'emergere di temi di nicchia ancora poco trasversali a livello di disciplina, ma che mostrano un elevato grado di coerenza interna, come l'environmental disclosure e l'ESG performance, legate alla sostenibilità, anche ambientale, dell'azione imprenditoriale.

Il presente studio presenta, tuttavia, alcune limitazioni ineludibili.

In primo luogo, la raccolta dati è stata intenzionalmente diretta e limitata al database Web of Science, che, sebbene sia uno dei più ricchi in termini di letteratura scientifica indicizzata, potrebbe averci fornito una visione parziale dell'intero panorama della ricerca che insiste sui temi della

diversità e dell'inclusione, escludendo ad esempio i prodotti scientifici indicizzati su SCOPUS e Google Scholar ma non su WoS.

In secondo luogo, il numero di contributi inclusi nel sample è senz'altro stato influenzato dai limiti temporali e linguistici imposti in fase di raccolta dati, dato che sono stati esclusi i paper pubblicati in data anteriore al 1 gennaio 2010 e quelli scritti in lingua diversa dall'inglese. Ciò può astrattamente aver ridotto la generalizzabilità dei risultati, e le future ricerche nell'ambito potrebbero prendere in considerazione criteri di selezione maggiormente inclusivi.

In terzo luogo, la fase di raccolta dati potrebbe essere stata viziata dai bias cognitivi dei ricercatori, e la scelta delle keyword potrebbe non aver catturato l'intero panorama della letteratura, a causa, ad esempio, della mancata inclusione di sinonimi rilevanti.

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Effetti sulla performance delle leggi sulle quote di genere

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Abstract

Inquadramento della ricerca. L'introduzione di leggi sulle quote di genere in molti Paesi ha ricevuto molta attenzione nella letteratura e nel discorso politico. Da un lato, i sostenitori delle leggi sulle quote di genere sottolineano la possibilità di aumentare le opportunità per le donne e la loro partecipazione ai consigli di amministrazione (CDA). Dall'altro lato, gli oppositori sottolineano il rischio di ridurre l'efficacia dei CDA, con un impatto negativo sulla performance delle imprese.

Obiettivo del paper. L'obiettivo di questo studio è valutare l'impatto delle leggi sulle quote di genere sulla performance aziendale (misurata con ROE, ROA e ROI).

Metodologia. L'analisi utilizza un database di 14136 imprese italiane e il treatment effect model.

Risultati. L'analisi econometrica rivela che le leggi sulle quote di genere hanno un impatto negativo sulla performance aziendale.

Limiti della ricerca. L'analisi non considera tutti i fattori (e.g., obiettivi aziendali, livello iniziale di performance, contesto istituzionale) che possono influenzare la relazione esaminata. Inoltre lo studio considera solo il contesto italiano.

Implicazioni manageriali. Nonostante l'analisi econometrica riveli un impatto negativo sulla performance aziendale, la presenza femminile nei CDA ha enormi effetti positivi ben noti in letteratura. Gli enti pubblici a fare di più e ad aggiungere ulteriori incentivi oltre alla semplice imposizione di leggi sulle quote per promuovere la presenza delle donne.

Originalità del paper. Lo studio avanza la letteratura precedente analizzando l'impatto delle leggi sulle quote di genere anni dopo la loro introduzione e utilizzando un approccio teorico (la resource based theory).

Parole chiave: Leggi sulle quote di genere; performance aziendale

Framing of the research. The introduction of gender quota laws in many countries has received much attention in the literature and political discourse. On the one hand, supporters of gender quota laws emphasise the possibility of increasing opportunities for women and their participation in boards of directors. On the other hand, opponents point to the risk of reducing the effectiveness of boards of directors, with a negative impact on company performance.

Purpose of the paper. The aim of this study is to assess the impact of gender quota laws on corporate performance (measured by ROE, ROA and ROI).

Methodology. The analysis uses a database of 14136 Italian firms and the treatment effect model.

Results. The econometric analysis reveals that gender quota laws have a negative impact on firm performance.

Research limitations. The analysis does not consider all factors (e.g. corporate objectives, initial level of performance, institutional context) that may influence the examined relationship. Moreover, the study only considers the Italian context.

Managerial implications. Despite the fact that the econometric analysis reveals a negative impact on corporate performance, the presence of women on boards of directors has enormous positive effects that are well known in the literature. Public bodies to do more and add further incentives beyond the simple imposition of quota laws to promote women's presence.

Originality of the paper. The study advances previous literature by analysing the impact of gender quota laws years after their introduction and using a theoretical approach (the resource-based theory).

Key words: Gender quota laws; firm performance

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1. Introduzione

Le donne sono ancora sottorappresentate in molti ambiti, tra cui la politica, il mercato del lavoro, la dirigenza e i vertici aziendali (Atinc *et al.*, 2022; Pastore e Tommaso, 2016). Negli ultimi anni sono aumentate le donne nei consigli di amministrazione (CDA), ma rappresentano ancora una minoranza e i CDA equilibrati dal punto di vista del genere restano pochi (e.g., Comi *et al.*, 2020; Ferrari *et al.*, 2022; Kirsch, 2021). Nel 2022 le donne rappresentavano solo il 32% degli amministratori delle maggiori società quotate dell'Unione Europea e nel 2020 solo l'8% di tutti gli amministratori delegati e dei presidenti dei CDA (European Institute for Gender equality, 2022).

La sottorappresentazione delle donne nei CDA è dovuta alle barriere irragionevoli che le donne devono affrontare per avanzare di carriera (Kogut *et al.*, 2014). Promuovere la rappresentanza femminile nei CDA è diventata una priorità in molti Paesi (e.g., Atinc *et al.*, 2022; Post e Byron, 2015). A tal fine, in Europa sono stati adottati tre tipi di politiche: leggi sulle quote di genere, che obbligano le imprese a raggiungere una certa quota di membri di gruppi sottorappresentati entro un certo periodo di tempo; raccomandazioni per l'inclusione delle donne nei CDA; leggi che impongono la disclosure della presenza femminile nei CDA (Kirsch, 2021; Leszczyńska, 2018). Tra queste politiche, le leggi sulle quote di genere hanno ricevuto molta attenzione in letteratura e nel discorso politico (e.g., Atinc *et al.*, 2022).

Da un lato, le leggi sulle quote di genere rappresentano promuovono l'uguaglianza delle opportunità (Ferrari *et al.*, 2022), la rimozione delle barriere nell'accesso alle posizioni di comando (Atinc *et al.*, 2022) e l'inclusione delle donne nella governance aziendale con tutti gli effetti positivi che la loro presenza comporta (il cosiddetto "*business case*") (Hamplova *et al.*, 2019). Tuttavia, queste leggi sono considerate illegittime e antidemocratiche (e.g., Chandler, 2016), ostacolano il diritto degli stakeholder di nominare liberamente gli amministratori (e.g., Velkova, 2015), violano la meritocrazia (Ferrari *et al.*, 2022), favoriscono il tokenismo (Leszczyńska, 2018) e influiscono negativamente sul funzionamento dei CDA (e.g., Hamplova *et al.*, 2019).

Gli studi che analizzano l'impatto delle leggi sulle quote di genere si dividono in due filoni. Il primo esamina se queste leggi sono efficaci nell'aumentare la presenza femminile (l'obiettivo della legge) (e.g., De Masi *et al.*, 2018; Pastore e Tommaso, 2016). Il secondo filone esamina se l'introduzione di queste leggi ha un effetto sugli indicatori economici dell'impresa interessata (e.g., valore di mercato, performance, profitti, produttività) (e.g., Ahern e Dittmar, 2012; Comi *et al.*, 2020; Greene *et al.*, 2020); questi impatti vanno al di là degli obiettivi della legge. Il presente studio si inserisce nel secondo filone.

Sebbene gli studi che analizzano l'impatto delle leggi sulle quote di genere sugli indicatori economici delle imprese soggette identificano generalmente un impatto negativo, non è ancora chiaro come il coinvolgimento delle donne nei CDA in seguito all'introduzione di queste leggi influisca sulla performance delle imprese (Comi *et al.*, 2020). Inoltre, i pochi studi esistenti presentano importanti limitazioni. In primo luogo, gli studi esistenti adottano normalmente un approccio di tipo *difference-in-difference*, considerando sempre il confronto tra le imprese soggette alla legge sulle quote di genere prima e dopo l'intervento pubblico; non esistono perciò studi che confrontano imprese soggette a leggi sulle quote di genere e imprese che non ne sono soggette. Secondo, solo pochi studi analizzano l'impatto della legge sulle quote di genere anni dopo la sua introduzione, data la recente introduzione di queste misure. Infine, gli studi esistenti generalmente non utilizzano un approccio teorico per esaminare la questione; gli studi di Comi *et al.* (2020) e Pastore e Tommaso (2016) sono gli unici che adottano una teoria, in particolare la *resource based theory*.

Partendo da questi gap, il nostro studio adotta la *resource based theory* e analizza l'impatto delle leggi sulle quote di genere sulla performance aziendale nel contesto italiano attraverso un approccio controfattuale (Bondonio, 2000). Nel 2011, l'Italia ha adottato la Legge Golfo Mosca (Legge 120/2011), che si applica ai CDA delle società quotate e delle imprese statali e richiede che i CDA (indipendentemente dalla loro dimensione) siano composti da almeno il 20% di ciascun genere entro il 2012 e dal 33% entro il 2015. Nel 2019 la legge è stata modificata e a partire dal

2020 il 40% degli amministratori dovrà essere costituito da donne. L'Italia rappresenta un contesto di analisi interessante in quanto nel 2020 si è classificata al 14° posto nell'Unione Europea per quanto riguarda il Gender Equality Index (European Institute for Gender Equality, 2020) e nello stesso anno solo il 37% degli amministratori era donna (European Institute for Gender Equality, 2020).

Dal punto di vista metodologico, questo studio adotta un *two-stage traditional treatment effect model* (Lee, 2005). La prima regressione stima la probabilità che un'impresa sia soggetta alla legge sulle quote di genere attraverso una regressione *probit*; la seconda regressione stima la performance dell'impresa (misurata con ROE, ROA e ROI) in funzione del trattamento (i.e., dell'essere soggetta alla legge), prendendo in considerazione altre variabili dipendenti che potrebbero influenzare la performance dell'impresa. L'analisi utilizza un database riferito al 2019 e composto da 14136 imprese italiane. L'analisi econometrica rivela un impatto negativo della legge sulle quote di genere sulla performance aziendale (misurata con ROE, ROA e ROI).

Da questo lavoro derivano importanti implicazioni politiche e manageriali, che saranno discusse nella Sezione 5 Discussione e Conclusioni.

2. Literature review

2.1 L'impatto delle donne sulla performance aziendale (“business case”)

Le leggi sulle quote di genere promuovono una maggiore presenza di donne nei CDA per ragioni di equità (e.g., Ferrari *et al.*, 2022). Tuttavia, le leggi sulle quote di genere possono anche favorire indirettamente l'efficienza economica e la redditività (De Vita e Magliocco, 2018).

I benefici economici che le imprese possono trarre dall'inclusione di donne nei CDA e da CDA equilibrati dal punto di vista del genere, una volta capitalizzate le opportunità create, sono identificati con il termine “*business case*” (Kirsch, 2021; Oberfield, 2014).

I *gender-diverse* CDA hanno risultati migliori rispetto a quelli composti da soli uomini per diverse ragioni (Terjesen e Sealy, 2016). L'inclusione significativa di donne nei CDA migliora i processi di *corporate governance* (Kirsch, 2021) perché la presenza delle donne promuove discussioni più ampie, che prendono in considerazione diverse alternative (Atinc *et al.*, 2022; Hamplova *et al.*, 2019; Pastore e Tommaso, 2016), e consente di riconoscere meglio gli interessi e le esigenze degli stakeholder e dei clienti dell'impresa (Atinc *et al.*, 2022; Pastore e Tommaso, 2016). Le pratiche di *governance* aziendale diventano più trasparenti (Terjesen *et al.*, 2009). Inoltre, poiché le donne tendono a essere più indipendenti dal *management* consentono un migliore monitoraggio e una maggiore vigilanza (Atinc *et al.*, 2022; Mateos de Cabo *et al.*, 2019). Il processo decisionale migliora e diventa più completo (Bart e McQueen, 2013; Pastore e Tommaso, 2016; Terjesen *et al.*, 2009).

Inoltre, alla luce della *resource based theory* (Barney, 1991, 1996), le donne direttrici apportano al CDA molte risorse preziose (e.g., Comi *et al.*, 2020) quali competenze, conoscenze, idee e punti di vista diversi (cioè eterogenei rispetto a quelli degli uomini) (Ferrari *et al.*, 2022; Pastore e Tommaso, 2016) e consentono l'accesso a reti diverse (Atinc *et al.*, 2022).

Le donne nei CDA hanno infine un impatto sulla performance, il cui impatto però non è chiaro: secondo alcuni studi l'impatto è positivo (e.g., Campbell e Mínguez-Vera, 2008; Erhardt *et al.*, 2003; Post e Byron, 2015; Terjesen *et al.*, 2009); secondo altri l'impatto è negativo (e.g., Adams e Ferreira, 2009; Shehata *et al.*, 2017); infine, alcuni studi individuano un effetto nullo (e.g., Carter *et al.*, 2010; Rose, 2007).

2.2 Ragioni pro e contro le leggi sulle quote di genere

Sono state avanzate varie ragioni di tipo etico ed economico a favore e contro l'imposizione di leggi sulle quote di genere (De Vita e Magliocco, 2018; Hamplova *et al.*, 2019).

Le leggi sulle quote di genere sono un riconoscimento che la sottorappresentazione delle donne è inaccettabile (Atinc *et al.*, 2022) e una soluzione valida per equiparare le opportunità (Ferrari *et al.*, 2022), promuovere la partecipazione delle donne al mercato del lavoro e il loro coinvolgimento in posizioni qualificate (De Vita e Magliocco, 2018). Le leggi sulle quote di genere consentono inoltre di superare l'inefficacia delle raccomandazioni di genere, che non sempre riescono a promuovere un cambiamento (Fagan e Gonzáles Menéndez, 2012; Mensi-Klarbach e Seierstad, 2020). Le leggi sulle quote di genere consentono alle donne di mettersi alla prova (Hamplova *et al.*, 2019; Seierstad, 2016).

A livello aziendale, le leggi sulle quote di genere consentono di aumentare il numero di donne direttrici (e.g., Chandler, 2016; Dahlerup e Freidenvall, 2005) poichè consentono di distruggere le barriere nell'accesso alle posizioni di comando (e.g., *glass ceiling*) (Atinc *et al.*, 2022; De Vita e Magliocco, 2018; Ferrari *et al.*, 2022). Le leggi sulle quote di genere consentono infine di ottenere i benefici indicati con il termine "*business case*" (Hamplova *et al.*, 2019). Gli effetti positivi raggiunti all'interno delle imprese non riguardano solo gli stakeholder dell'azienda, ma anche la società nel suo complesso (Kirsch, 2021).

Parallelamente alle ragioni a favore dell'imposizione delle leggi sulle quote di genere, alcuni studi ne evidenziano i limiti. Secondo alcuni autori, le leggi sulle quote di genere sono solo un "falso progresso verso l'uguaglianza di genere" (Bagues e Esteve-Volart, 2010; Fagan e Gonzáles Menéndez, 2012). Inoltre queste leggi possono essere considerate illegittime e antidemocratiche e causano discriminazioni e disparità di trattamento nei confronti degli uomini (Chandler, 2016; Dale-Olsen *et al.*, 2013; Velkova, 2015).

Anche a livello aziendale, si osserva che le leggi sulle quote di genere possono ostacolare il diritto degli stakeholder di nominare liberamente amministratori uomini e donne (e.g., Chandler, 2016; Dale-Olsen *et al.*, 2013; Velkova, 2015). Le leggi sulle quote di genere possono anche violare la meritocrazia (Ferrari *et al.*, 2022) e costringere le imprese a nominare donne meno qualificate o incapaci di svolgere con successo la posizione pur di rispettare la legge (Ferrari *et al.*, 2022; Leszczyńska, 2018; Pastore e Tommaso, 2016). Le conseguenze sono due. Primo, le donne saranno sempre messe in discussione per quanto riguarda le loro competenze (Freidenvall e Hallonsten, 2013), facilitando il tokenismo e gli stereotipi di genere verso le donne (Fagan e Gonzáles Menéndez, 2012; Leszczyńska, 2018; Piscopo e Clark Muntean, 2018). Secondo, la modifica "forzata" del CDA può ridurre l'efficacia del consiglio e la qualità delle decisioni e aumentare il rischio di conflitti (Ferrari *et al.*, 2022; Hamplova *et al.*, 2019; Leszczyńska, 2018), con conseguente riduzione del valore di mercato e della performance dell'impresa (e.g., Ahern e Dittmar, 2012; Bøhren e Staubo, 2016; Meyerinck *et al.*, 2018).

2.3 Leggi sulle quote di genere e impatto sulla performance aziendale

Gli studi che analizzano l'impatto della legge sulle quote di genere sulla performance aziendale utilizzano vari indicatori e giungono a risultati contrastanti.

Le leggi sulle quote di genere riducono il ROA (Bøhren e Staubo, 2016). In particolare, queste leggi aumentano la quota di amministratori indipendenti perché le donne tendono a essere più indipendenti degli uomini; questo, a sua volta, riduce il ROA perché i consigli degli amministratori dipendenti sono più importanti per la performance dell'impresa rispetto al monitoraggio degli amministratori indipendenti (Bøhren e Staubo, 2016). Yang *et al.* (2019) confermano l'impatto negativo delle leggi sulle quote di genere sul ROA.

Al contrario, secondo altri studi le leggi sulle quote di genere hanno un effetto positivo sul ROAE (return on average equity) e sul ROAA (return on average assets) (Mazzotta e Ferraro, 2020). In particolare, l'impatto delle donne nei CDA sul ROAE e sul ROAA era nullo prima dell'introduzione della legge sulle quote di genere e positivo dopo (Mazzotta e Ferraro, 2020). Questo perché prima dell'introduzione della legge sulle quote di genere, le donne nei CDA erano poche e percepite come incapaci di influenzare la performance aziendale (Mazzotta e Ferraro, 2020).

Altri autori stimano un effetto nullo delle leggi sulle quote di genere sul ROA (Dale-Olsen *et al.*, 2013; Ferrari *et al.*, 2022).

Secondo altri studi, l'impatto delle leggi sulle quote di genere sul ROA dipende dal contesto: le leggi sulle quote di genere diminuiscono il ROA in Francia e Spagna, ma hanno un effetto nullo in Italia (Comi *et al.*, 2020).

2.4 La domanda di ricerca

L'impatto delle leggi sulle quote di genere sulla performance aziendale non è chiaro a priori (Comi *et al.*, 2020; Dale-Olsen *et al.*, 2013; Meyerinck *et al.*, 2018).

Da un lato, in linea con il “*business case*”, le leggi sulle quote di genere potrebbero aumentare la performance delle imprese grazie a una maggiore parità di genere nei CDA e agli effetti positivi che essa comporta: processi di governance aziendale migliori; processi decisionali migliori grazie a discussioni più approfondite, maggiore trasparenza e migliore monitoraggio; apporto di competenze e conoscenze diverse e preziose (e.g., Atinc *et al.*, 2022; Ferrari *et al.*, 2022; Pastore e Tommaso, 2016; Terjesen *et al.*, 2009). Ci si aspetta quindi che le leggi sulle quote di genere aumentino la performance dell'impresa.

D'altra parte, le leggi sulle quote di genere potrebbero ridurre la performance dell'impresa per due ragioni principali. In primo luogo, le leggi sulle quote di genere impongono un cambiamento nell'attuale consiglio di amministrazione (Comi *et al.*, 2020; Ferreira, 2015). Questo cambiamento potrebbe rappresentare uno “*shock negativo*” che può costringere le imprese a modificare un consiglio di amministrazione efficiente (Ahern e Dittmar, 2012; Dale-Olsen *et al.*, 2013). Secondo, poiché le imprese sono costrette a nominare amministratori donne per rispettare la legge (Leszczyńska, 2018), queste donne potrebbero essere meno qualificate o incapaci di ricoprire con successo la posizione (Comi *et al.*, 2020; Ferrari *et al.*, 2022). Si prevede quindi che le leggi sulle quote di genere riducono la performance aziendale quando le donne vengono nominate solo per rispettare la legge e senza tener conto del merito (Mazzotta e Ferraro, 2020).

Pochi studi esistenti che stimano l'impatto delle leggi sulle quote di genere sulla performance aziendale danno risultati in linea con entrambe le ipotesi. Pertanto, ulteriori ricerche sono necessarie per chiarire questa relazione. Lo studio si propone perciò di rispondere a questa domanda di ricerca: *Qual è l'impatto delle donne nei CDA sulla performance delle imprese quando sono in vigore le leggi sulle quote di genere?*

3. Metodologia

3.1 Dati

Per valutare l'effetto delle leggi sulle quote di genere sulla performance delle imprese, viene utilizzato un database riferito al 2019. Il database è composto da 14,136 imprese italiane, di cui 371 sono imprese soggette alla legge italiana sulle quote di genere ovvero imprese quotate (pari al 98,93% del numero totale di imprese soggette alla legge). La scelta del campione di controllo avviene in modo casuale e test χ^2 hanno confermato la rappresentatività della popolazione.

Per ogni azienda sono state raccolte le seguenti informazioni: presenza di amministratori donna, anno di fondazione, sede, situazione finanziaria ed economica, innovazione e status di multinazionale. I dati sono stati estratti dal database Orbis Bureau van Dijk (Orbis Intellectual Property per i dati relativi all'innovazione), ad eccezione dei dati relativi allo status multinazionale dell'impresa, che sono stati ricavati da Reprint (Mariotti e Mutinelli, 2017).

3.2 Modello

L'effetto di una politica pubblica (cioè il trattamento) si ottiene attraverso la differenza tra una variabile osservabile nei soggetti del campione trattato e il valore controfattuale (Ferraro, 2009).

Quest'ultimo può essere attribuito alla situazione in cui si sarebbero trovati i soggetti se non fossero stati esposti a una certa politica pubblica (Ferraro, 2009). Questa stima è importante per capire se l'effetto del fenomeno studiato è effettivamente il risultato della politica pubblica, evidenziando la relazione causa-effetto (Crano, 1991). I problemi nella stima dell'effetto riguardano: la dinamica spontanea dovuta a fattori esterni, cioè il diverso andamento della variabile risultato nella popolazione controfattuale e in quella target; la variabile omessa, cioè i cambiamenti esterni alla politica pubblica che possono influenzare l'esito dello studio; il bias di selezione, che dipende dalle caratteristiche del campione target e del controfattuale senza trattamento (Bartik e Bingham, 1995; Gramillano, 2012). Il bias di selezione può essere causato dall'autoselezione nel trattamento dei soggetti studiati o dalla decisione di selezione presa da chi controlla le politiche pubbliche (Heckman, 1979). Nel nostro caso, il bias di selezione è dato dalla presenza di donne nel board, che è il risultato dell'introduzione della Legge Golfo Mosca (cioè del trattamento). Non esiste quindi un problema di autoselezione (che spesso è il più difficile da controllare empiricamente) ma solo l'effetto di selezione dato dalla legge.

Per evitare il problema della dinamica spontanea e quello delle variabili omesse (tipico dei modelli *one group design*) (Bondonio, 2000), utilizziamo un modello appartenente alla *comparison group design family*, nello specifico un *two-stage traditional treatment effect model* (Lee, 2005). Vengono stimati due tipi di regressioni: la prima stima la probabilità che un'impresa sia soggetta alla legge (cioè la probabilità di essere trattata) attraverso una regressione *probit*, la seconda stima la performance dell'impresa in funzione della variabile di trattamento, tenendo conto di altre variabili indipendenti che potrebbero influenzare la performance dell'impresa. Il primo stadio è un modello in cui la probabilità di essere trattati è rappresentata da D^*_i per spiegare la differenza tra un'impresa trattata e una non trattata. x_i rappresentano le covariate osservate, che sono variabili indipendenti utilizzate per spiegare i diversi atteggiamenti tra un'impresa trattata e una non trattata. L'equazione di selezione ha anche una componente casuale u_i . L'equazione di selezione è definita come segue:

$$D^*_i = x_i + u_i \text{ (primo stadio, equazione di selezione)}$$

Nel nostro caso, l'equazione per il primo stadio, comune a tutti i modelli proposti, è definita come in Tab. 3 Modello 0.

Nel secondo stadio del modello, D_i (variabile binaria endogena) è definita come il risultato della variabile dipendente del primo stadio D^*_i :

$$\begin{aligned} D_i &= 1 \text{ se } D^*_i > 0, \\ D_i &= 0 \text{ altrimenti.} \end{aligned}$$

Il secondo stadio, che si concentra sulla performance dell'impresa y_i , prevede una regressione lineare. Questa funzione comprende la variabile di trattamento del primo stadio D_i , altre variabili dipendenti esogene w_i e una variabile latente u_i . L'equazione di valutazione è definita come segue:

$$y_i = w_i + D_i + u_i \text{ (secondo stadio, equazione di valutazione)}$$

Nel nostro caso, l'equazione per il secondo stadio prevede l'analisi dell'impatto sul ROE, ROA e ROI. Le equazioni sono definite come in Tab. 3, Modello 1a (ROE), Modello 1b (ROA) e Modello 1c (ROI).

Infine, per analizzare l'impatto congiunto sulla performance dell'essere soggetti alla legge sulle quote di genere e della presenza di amministratori donne, utilizziamo modelli di interazione, definiti come in Tab. 3, Modello 2a (ROE), Modello 2b (ROA) e Modello 2c (ROI).

3.3 Definizione delle variabili

La Tab. 1 riporta le definizioni e le fonti delle variabili utilizzate.

Tab. 1: Definizione delle variabili

Variabili	Definizioni	Fonte
Variabili dipendenti		
Impresa trattata	Variabile dummy pari a 1 se l'impresa è quotata in borsa e a 0 altrimenti	Orbis
ROE	Rendimento del patrimonio netto, dato dall'utile netto sul patrimonio netto	Orbis
ROA	Rendimento delle attività, dato dall'utile netto sulle attività	Orbis
ROI	Rendimento del capitale investito, dato dal reddito netto degli investimenti	Orbis
Variabili indipendenti		
Presenza di donne nel board	Percentuale di donne nel board	Orbis
Dimensione dell'impresa	Logaritmo del numero di dipendenti	Orbis
Età dell'impresa	Numero di anni dalla fondazione dell'impresa	Orbis
Innovazione	Variabile dummy pari a 1 se l'impresa detiene un brevetto e a 0 altrimenti	Orbis Intellectual Property
IDE	Numero di IDE completati dall'impresa	Reprint
Rischio	Deviazione standard del rendimento delle attività negli ultimi 5 anni	Orbis
Nord Italia	Variabile dummy pari a 1 se l'impresa è situata nel Nord Italia, e 0 altrimenti	Orbis
Centro Italia	Variabile dummy pari a 1 se l'impresa è situata nell'Italia centrale e a 0 altrimenti	Orbis
Pavitt suppliers dominated	Variabile dummy pari a 1 se l'impresa è un suppliers dominated e a 0 altrimenti	Orbis
Pavitt scale and information intensive	Variabile dummy pari a 1 se l'impresa è un scale and information intensive e a 0 altrimenti	Orbis
Pavitt specialized supplier	Variabile dummy pari a 1 se l'impresa è un specialized supplier e a 0 altrimenti	Orbis
Pavitt science based	Variabile dummy pari a 1 se l'impresa è un science based e a 0 altrimenti	Orbis

Fonte: ns. elaborazioni

Variabili dipendenti. Nel primo stadio del modello, la variabile dipendente è *Impresa trattata*, una variabile dummy che assume il valore 1 se l'impresa è soggetta alla legge sulle quote di genere e 0 altrimenti. Nel secondo stadio dei modelli, le variabili dipendenti sono gli indicatori di performance *ROA*, *ROE* e *ROI* in linea con gli studi precedenti (Comi *et al.*, 2020; Dale-Olsen *et al.*, 2013; Mazzotta e Ferraro, 2020).

Variabili esplicative. Le variabili indipendenti utilizzate nell'analisi includono la *Presenza di donne nel board*, che misura la percentuale di donne nel board delle imprese (De Masi *et al.*, 2018; Ferrari *et al.*, 2022; Latura e Weeks, 2022; Meyerinck, 2018). Si sono considerate anche le variabili *Dimensione dell'impresa* (misurata come il logaritmo del numero di dipendenti) e *Età dell'impresa* (misurata con il numero di anni dalla fondazione dell'impresa). Il grado di innovazione e internazionalizzazione sono considerati con le variabili *Innovazione* (variabile dummy pari a 1 se l'impresa detiene un brevetto e a 0 in caso contrario) e *IDE* (numero di IDE completati dall'impresa). Si considera la variabile *Rischio*, data dalla deviazione standard del rendimento delle attività negli ultimi 5 anni (Miller e Chen, 2004). Il contesto è considerato con le variabili *Nord Italia* e *Centro Italia* (variabili dummy pari a 1 se l'impresa si trova rispettivamente nel Nord Italia o nel Centro Italia, e 0 altrimenti). Infine, è considerato il settore di appartenenza secondo la tassonomia di Pavitt (Bogliacino e Pianta, 2016, Pavitt, 1984): *Pavitt suppliers dominated*, *Pavitt scale and information intensive*, *Pavitt specialized supplier* e *Pavitt science based*, sono tutte variabili dummy.

4. I risultati

4.1 Statistiche descrittive

La Tab. 2 riporta le medie, le deviazioni standard, i valori minimi e massimi delle variabili.

Tab. 2: Statistiche descrittive

Variabili	Media/%	Dev. Std.	Min	Max
Impresa trattata	2.62%	0.16	0.00	1.00
ROE	2.78 %	13.11	-99.07%	97.17%
ROA	2.72 %	13.12	-99.07%	97.17%
ROI	5.44 %	7.95	-29.97%	29.94%
Presenza di donne nel board	17.52%	0.23	0.00%	100.00%
Dimensione dell'impresa	4.06	1.30	1.61	11.68
Età dell'impresa	22.58	19.19	0.00	188.00
Innovazione	20.69%	0.41	0.00	1.00
IDE	0.36	3.22	0.00	155.00
Rischio	6.33	14.47	0.00	369.34
Nord Italia	73.41%	0.44	0.00	1.00
Centro Italia	18.60%	0.39	0.00	1.00
Pavitt suppliers dominated	32.11%	0.47	0.00	1.00
Pavitt scale and information intensive	13.57%	0.34	0.00	1.00
Pavitt specialized supplier	27.12%	0.44	0.00	1.00
Pavitt science based	9.73%	0.30	0.00	1.00

Fonte: ns. elaborazioni

In media, nell'intero campione di imprese, il *ROE* è pari al 2,78%, il *ROA* al 2,72% e il *ROI* al 5,44%. La *Percentuale di donne nel board* è del 17,52% nell'intero campione di imprese.

4.2 Risultati econometrici

La Tab. 3 mostra i risultati della regressione per i modelli.

Tab. 3: Risultati econometrici

VARIABILI	Modello 0	Modello 1a	Modello 1b	Modello 2a	Modello 2b	Modello 3a	Modello 3b
	Primo stadio Impresa trattata	Secondo stadio ROE	Secondo stadio ROE	Secondo stadio ROA	Secondo stadio ROA	Secondo stadio ROI	Secondo stadio ROI
Impresa trattata		2.267 (4.784)	8.013 (5.249)	2.151 (4.788)	7.940 (5.254)	5.726** (2.801)	8.168*** (3.037)
Presenza di donne nel board		0.860* (0.475)	0.982** (0.477)	0.933** (0.475)	1.055** (0.477)	0.015 (0.289)	0.067 (0.291)
Impresa trattata × Presenza di donne nel board			-11.113** (4.330)		-11.194*** (4.335)		-4.722* (2.414)
Dimensione dell'impresa	0.152*** (0.017)	-0.137 (0.099)	-0.155 (0.100)	-0.144 (0.099)	-0.162 (0.100)	-0.039 (0.060)	-0.047 (0.061)
Età dell'impresa	0.003*** (0.001)	0.042*** (0.006)	0.042*** (0.006)	0.043*** (0.006)	0.043*** (0.006)	-0.002 (0.004)	-0.002 (0.004)
Innovazione		0.442 (0.291)	0.396 (0.291)	0.398 (0.291)	0.440 (0.291)	1.155*** (0.176)	1.154*** (0.176)
IDE	0.041*** (0.005)	-0.039 (0.056)	-0.056 (0.056)	-0.037 (0.056)	-0.054 (0.056)	-0.097*** (0.033)	-0.105*** (0.033)
Rischio		-0.085*** (0.008)	-0.085*** (0.008)	-0.084*** (0.008)	-0.083*** (0.008)	-0.010** (0.005)	-0.010** (0.005)
Nord Italia	0.167 (0.110)	0.286 (0.413)	0.261 (0.414)	0.360 (0.413)	0.334 (0.414)	-0.129 (0.254)	-0.140 (0.255)
Centro Italia	0.244** (0.119)	0.251 (0.467)	0.207 (0.469)	0.322 (0.467)	0.278 (0.469)	-0.322 (0.287)	-0.340 (0.289)
Pavitt science based	0.705*** (0.101)	1.233** (0.484)	1.100** (0.487)	1.337*** (0.484)	1.202** (0.487)	0.687** (0.295)	0.630** (0.297)
Pavitt specialized supplier	0.484*** (0.092)	0.886** (0.354)	0.836** (0.355)	0.953*** (0.354)	0.903** (0.355)	-0.105 (0.217)	-0.126 (0.218)
Pavitt scale and information intensive	0.608*** (0.097)	0.686 (0.427)	0.611 (0.428)	0.806* (0.427)	0.731* (0.428)	-0.678*** (0.261)	-0.710*** (0.262)
Pavitt suppliers dominated	0.167* (0.096)	0.474 (0.331)	0.461 (0.331)	0.572* (0.331)	0.558* (0.332)	1.083*** (0.203)	1.077*** (0.204)
Costante	-3.288*** (0.151)	1.782*** (0.611)	1.829*** (0.612)	1.562** (0.611)	1.609*** (0.612)	5.222*** (0.374)	5.242*** (0.375)
Osservazioni	14,136	14,136	14,136	14,136	14,136	14,136	14,136
Lambda		-1.959 (2.084)	-3.293 (2.131)	-1.898 (2.086)	-3.241 (2.133)	-3.606*** (1.219)	-4.173*** (1.236)

Fonte: ns. elaborazioni

Considerando il primo stadio (Modello 0), comune a tutti i modelli, emerge che la *Dimensione dell'impresa* e l'*Età dell'impresa* hanno coefficienti positivi e significativi (rispettivamente $b=0,152$, $p<0,01$ e $b=0,003$, $p<0,01$). Anche gli *IDE* hanno un coefficiente positivo e significativo ($b=0,041$, $p<0,01$). Per quanto riguarda la localizzazione geografica, il *Nord Italia* ha un coefficiente positivo ma non significativo ($b=0,167$) e il *Centro Italia* ha un coefficiente positivo e significativo ($b=0,244$, $p<0,05$). Le variabili dummy che rappresentano la tassonomia Pavitt hanno tutte un coefficiente positivo ma con un diverso livello di significatività: *Pavitt science based* ($b=0,705$), *Pavitt specialized supplier* ($b=0,484$) e *Pavitt scale and information intensive* ($b=0,608$) hanno un livello di significatività $p<0,01$, mentre *Pavitt suppliers dominated* ($b=0,167$) un livello di significatività $p<0,1$.

Concentrandosi sul secondo stadio dei modelli, nel Modello 1a (impatto sul *ROE*), l'*Impresa trattata* ha un coefficiente positivo ma non significativo ($b=2,267$), mentre la *Presenza di donne nel board* ha un coefficiente positivo e significativo ($b=0,860$, $p<0,1$). Nel Modello 2a (impatto sul *ROA*), l'*Impresa trattata* ha un coefficiente positivo ma non significativo ($b=2,151$), mentre la *Presenza di donne nel board* ha un coefficiente positivo e significativo ($b=0,933$, $p<0,01$). Infine, nel modello 3a (impatto sul *ROI*), l'*Impresa trattata* ha un coefficiente positivo e significativo ($b=5,726$, $p<0,05$), mentre la *Presenza di donne nel board* ha un coefficiente positivo ma non significativo ($b=0,015$). Passando ai modelli con il termine di interazione, nel modello 1b (impatto sul *ROE*), l'*Impresa trattata* e la *Presenza di donne nel board* hanno entrambi un coefficiente positivo (rispettivamente $b=8,013$, non significativo e $b=0,982$, $p<0,05$), mentre il termine di interazione *Impresa trattata* \times *Presenza di donne nel board* ha un coefficiente negativo e significativo ($b=-11,113$, $p<0,05$). Nel modello 2b (impatto sul *ROA*), l'*Impresa trattata* e la *Presenza di donne nel board* hanno entrambi un coefficiente positivo (rispettivamente $b=7,940$, non significativo e $b=1,055$, $p<0,05$), mentre il termine di interazione *Impresa trattata* \times *Presenza di donne nel board* ha un coefficiente negativo e significativo ($b=-11,194$, $p<0,01$). Infine, nel modello 3b (impatto sul *ROI*), l'*Impresa trattata* ha un coefficiente positivo e significativo ($b=8,168$, $p<0,01$), la *Presenza di donne nel board* ha un coefficiente positivo ma non significativo ($b=0,067$), mentre il termine di interazione *Impresa trattata* \times *Presenza di donne nel board* ha un coefficiente negativo e significativo ($b=-4,722$, $p<0,1$).

Per quanto riguarda le altre variabili, la *Dimensione dell'impresa* ha un coefficiente negativo e non significativo in tutti i modelli. L'*Età dell'impresa* ha un coefficiente positivo e significativo nei modelli 1a, 1b, 2a e 2b, mentre nei modelli 3a e 3b è negativo e non significativo. L'*Innovazione* è non significativa e positiva, tranne che nei modelli 3a e 3b dove è significativa. Gli *IDE* non sono significativi, tranne che nei modelli 3a e 3b, dove sono negativi e significativi. Il *Rischio* è negativo e significativo in tutti i modelli del secondo stadio. Il *Nord Italia* e il *Centro Italia* non sono significativi in tutti i modelli del secondo stadio. Le differenze in termini di settore hanno un effetto sulla performance.

5. Discussione e conclusioni

Il presente ha cercato di chiarire l'impatto delle leggi sulle quote di genere sulla performance aziendale. Abbiamo adottato la lente teorica della *resource based theory* e un approccio controfattuale, trovando evidenza che le leggi sulle quote di genere hanno un impatto negativo sulla performance aziendale (misurata con *ROE*, *ROA* e *ROI*).

La nostra analisi suggerisce che le leggi sulle quote di genere sono controproducenti. Tuttavia, va notato che la relazione tra le leggi sulle quote di genere e la performance aziendale è più complessa in quanto può dipendere anche dagli obiettivi dell'impresa, dal livello iniziale di performance e dal contesto istituzionale in cui l'impresa opera (Comi *et al.*, 2020). Inoltre, è difficile distinguere il ruolo e l'impatto di questi aspetti sulla performance aziendale quando si valuta l'impatto delle leggi sulle quote di genere (Comi *et al.*, 2020). Il primo limite di questo studio è rappresentato dalla mancata considerazione di questi aspetti.

Un ulteriore limite della nostra ricerca riguarda il metodo adottato. Questo studio adotta un approccio quantitativo e utilizza un *treatment effect model* per valutare l'impatto delle leggi sulle quote di genere. Studi futuri potrebbero adottare un *mixed method* per considerare fattori di natura diversa che moderano la relazione tra le leggi sulle quote di genere e la performance aziendale. Inoltre, questo studio prende in considerazione il contesto italiano; studi futuri potrebbero considerare altri contesti di analisi poiché i nostri risultati potrebbero non essere validi in altri contesti.

Un'altra limitazione del nostro studio riguarda la misura utilizzata per calcolare la presenza delle donne nel consiglio di amministrazione. Nel nostro studio, abbiamo classificato le donne in base al sesso invece di considerare il genere.

Siamo fermamente convinte dell'importanza dell'introduzione delle leggi sulle quote di genere in quanto hanno contribuito notevolmente ad aumentare la presenza delle donne nei CDA (Dale-Olsen *et al.*, 2013; Kirsch, 2021) e possono promuovere fortemente l'uguaglianza di genere (Hamplova *et al.*, 2019). A questo proposito, le leggi sulle quote di genere hanno avuto successo (Dale-Olsen *et al.*, 2013). Riteniamo inoltre che l'impatto negativo delle leggi sulle quote di genere sulla performance aziendale non debba essere al centro delle valutazioni a favore o contro l'introduzione di queste leggi. Vogliamo incoraggiare gli enti pubblici a fare di più e ad aggiungere ulteriori incentivi oltre alla semplice imposizione di leggi sulle quote per promuovere la presenza delle donne.

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Linking Humane Resource Management and CSR: a focus on the drivers of employees' commitment towards sustainability

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Abstract

Framing of the research. *The issue of sustainability and corporate social responsibility (CSR) is rapidly moving up the priority list of business leaders as the awareness of incorporating “green” into corporate strategy is also becoming an urgent item on the agenda of key stakeholders.*

Purpose of the paper. *This study explores specific employees' outcomes in terms of sustainability behaviors developing a framework focusing on the impact of some internal and external CSR activities on employees' commitment toward sustainability under the theoretical lenses of Humane Entrepreneurship theory and Sustainable Human Resources Management.*

Methodology. *A survey on 242 employees of 14 mechanical firms operating in the Province of Salerno has been administered. To test the research hypotheses an OLS Regression Analysis is performed.*

Results. *Employees tend to be more committed when they perceive a concrete engagement of their organization in achieving green goals oriented toward sustainability. The perceived clarity of firms' communication about sustainability goals and the perceived importance of firms educational programs devoted to improve sustainability knowledge positively impact on employees' commitment toward sustainability.*

Research limitations. *Sampling (exclusively firms located in small regional area limits the scope of interpretation of the results only to the countries or regions that can be compared to the Province of Salerno ecosystem in terms of legislation, regulation, and culture) and measurement (future research could take a more holistic view on the effectiveness of the educational process and not only to its availability inside the firm).*

Managerial implications. *Training and empowering workforce to identify and support innovative strategies for sustainability goals is a critical issue for the success of any firm sustainability oriented strategy.*

Originality of the paper. *The effectiveness of CSR on employees' commitment has remained largely neglected. Moreover, scholars have suggested that the impact of CSR on employee commitment depends on individual perception so the study assesses sustainability through perceptual perspective of human resources.*

Key words: *Employees' commitment; Sustainability; CSR; Humane Entrepreneurship; Human Resource Management*

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1. Introduction

The issue of sustainability and corporate social responsibility (CSR) is rapidly moving up the priority list of business leaders as the awareness of integrating “green” into corporate strategy is also becoming an urgent item on the agenda of key stakeholders (Wirtenberg, Harmon, Russell and Fairfield, 2007). In fact, in the last decades there has been an extraordinary increase in the request for resources driven on the one hand by the fast industrialization of emerging economies and on the other by the continued high levels of consumption of materials and resources in developed countries which is not in line with an infinite evolution of economic systems based on limited resources (Veleva *et al.*, 2017). It is now clear that economic organizations and the business world must necessarily review their business models and find ways and techniques to address the reduction of ecological impact, focusing on environmental and social factors, without neglecting traditional financial and economic goals (Daily *et al.*, 2007).

The pandemic has accelerated the need to transform the development model in a perspective that knows how to combine the economic needs of a balanced and far-sighted recovery with both the environmental (for a more systematic attention to the erosion of natural capital and the search for a new balance with nature) and social needs (connected to a fair transition that leaves no one behind) recognizing the role assumed by employees and more in general by humane resources.

In recent national and international academic literature, numerous authors have proposed a real field of study of ‘sustainable entrepreneurship’, addressing this concept towards the defense of the environment and society (Shepherd and Patzelt, 2011) and/or, more generally, in the attention to others (Gruber and MacMillan, 2017). The idea that the entrepreneurial action is today strongly intertwined with the theme of sustainability is therefore widespread in the literature (Hall *et al.*, 2010; Perrini and Tencati, 2008a, b; De Clercq and Voronov, 2011). The Humane Entrepreneurship theory (HumEnt), a recent framework that encapsulates a vision according to which companies should extend their priorities beyond the profit margin, shifting the focus to people, the environment and society (White Book, 2016) enclose the idea that, taken for granted the firms’ pursuit of profit and economic outcomes, hopes that entrepreneurial action will generate value by caring for the interests of the community, respecting society, the environment and valuing the contribution of human resources (Parente *et al.*, 2018; Kim *et al.*, 2018). The theory also highlights the need for all the forces operating within the company to have the environmental issue concretely at heart and for employees to perceive the need for the role they play in supporting the change towards sustainability. In fact, human resources’ is a function that has the greatest potential for including sustainability postulates in the organizational boundaries and in the company’s mission itself (Vickers 2005) since employees are the best ambassadors of a company to identify and implement innovative sustainability initiatives (Sharma *et al.*, 2009; Mirvis, 2012).

Accordingly, in the last ten years, a new paradigm to the strategic management of human resources has made its way, defined as “Sustainable Human Resources Management” (SHRM) (Ehnert, 2009; Ehnert and Harry, 2012). It links the classic approaches to the strategic management of human resources to issues of environmental sustainability and valorization of natural resources. Unlike traditional approaches to Strategic HRM (which mainly focuses on economic-financial performance), SHRM is configured as a holistic way to human resource management with the aim of enhancing employees’ commitment in the direction of sustainability (Jabbour and Santos, 2008a, b; Wang, 2019). In this sense, the recent stream of academic research has enlightened the need of focusing on the themes of social and environmental health, and on the relationship between HRM and results in terms of corporate social responsibility (CSR) and the Triple Bottom Line, i.e., processes that conduce to human and environmental results in accordance with the achievement of the classic economic-financial objectives (Vecchi *et al.*, 2021). Educating and empowering employees to identify and support innovative strategies in the perspective of sustainability and circular economy (Veleva *et al.* 2017) is indeed fundamental for the success of any strategy oriented towards ecological transition. Taking up the reflections offered by Veleva *et al.* (2017) it is essential

that management involves employees, through continuous communication and empowerment, to participate and initiate innovative approaches related to environmental sustainability issues.

Nevertheless, literature identifies that along certain streams of enquiry, CSR is somehow relatively embryonic for both academicians and practitioners and therefore it requires more empirical evidences and scholarship to support the theoretical framework (McWilliams *et al.*, 2006; Jones *et al.*, 2017). In fact, research to date has been mainly concentrated on founding an association between social performances and the overall financial attainment of organizations, whereas the effectiveness of CSR on the significant internal stakeholder - i.e., the employees - has remained largely neglected (Larson *et al.*, 2008; Turker, 2009; Jones *et al.*, 2017; Harvey *et al.*, 2017; Schons and Steinmeier, 2016; Kim *et al.*, 2010). Moreover, academics have suggested that the effect of CSR on employees' commitment is determined by individual perceptions (Mahmoud *et al.*, 2017; Rupp *et al.*, 2013; Bridoux *et al.*, 2016), so studies that assess sustainability through perceptual perspective are still required. This study, also answering the call of Hameed *et al.* (2016) on the necessity to understand specific employees' outcomes in terms of sustainability behaviors, will address these gaps by developing a framework focusing on the impact of CSR on employees' commitment toward sustainability under the theoretical lenses of Humane Entrepreneurship theory (Parente *et al.*, 2018; Kim *et al.*, 2018) and Sustainable Human Resources Management. A survey on 242 employees of 14 mechanical firms operating in the Province of Salerno has been administered to investigate the influence of different internal and external CSR practices on commitment toward sustainability.

This study contributes to CSR and HRM literature in several ways. First, it examines how perceived internal (communication and educational programs) and external (some firms' pro-environmental and sustainability behaviors) firms' CSR actions influence employees' commitment toward sustainability. Second, exploring the impact of some sustainability best practices, it could also help in strengthening firms' capacity for generally managing the impact of CSR initiatives (Shen and Zhang, 2019; Farooq *et al.*, 2019; Hameed *et al.*, 2016). Third, this study, adopting an individual perception perspective in assessing firms' sustainability actions, expands the body of knowledge related to employees' perceptual perspective.

The paper begins with a literature review of the theoretical frameworks of the research, continues with hypotheses' development and methodology and concludes discussing the main findings and implication for theory and practice.

2. Literature Review

2.1 The Humane Entrepreneurship theory (HumEnt)

The Humane Entrepreneurship (HumEnt) theory is expression of the need of new business models to answer to the United Nations 2030 Agenda and has been further developed by the unexpected event of COVID-19. Its epistemology (Parente *et al.*, 2018) and capability of creating decent jobs (Kim *et al.*, 2018) represent a clear theoretical support to those new firms' business models that aims to answer to the dynamic characteristics of actual economic system together with the increasing relevance of social and environmental issues.

Parente *et al.* (2018) propose a model of HumEnt that integrates the traditional Entrepreneurial Orientation with the orientation toward social and environmental sustainability. Starting from the triple bottom line (TBL) model (Elkington, 1994), authors qualify the entrepreneurial behaviors in terms of integration of three different elements: the attention for profit, the attention for people, and attention for the planet. More specifically, Parente *et al.* (2018, p. 32) suggest HumEnt as an enlarged Strategic Posture "based on EO theory, corporate social responsibility (CSR) theory, and servant leadership theory (SLT)", which is able to better address the even more relevant challenges of social and environmental sustainability that characterize modern organizational contexts (Dyllick and Hockerts, 2002). From this perspective, the HumEnt model sustains that such enlarged strategic

posture involves new processes of identification and exploration of entrepreneurial opportunities characterized by an active involvement of internal and external stakeholders.

Further, discussing the HumEnt model, Kim *et al.* (2018) mainly focuses on the necessity to combine EO with a specific orientation toward employees. In particular, Kim *et al.* (2018) propose a model of HumEnt based on the integration of leadership and entrepreneurship domains, generally considered as separate streams of inquiry. Starting from the key elements proposed by Pfeffer (1998a), and according to the basic principles of humanistic management (Melé, 2003), Kim *et al.* (2018) sustain that the integration of entrepreneurship, leadership, and human resource management (HRM) is a necessary condition to create wealth and quality jobs. Authors define Humane Resource Orientation (HRO, Vescei *et al.*, 2022; Kim *et al.*, 2018) through the identification of four components, that are empathy, equity, enablement, and empowerment. In this sense, employee engagement is considered as an effective firm's strategic behavior for reaching organizational improvement (Carmeli Schaubroeck and Tishler, 2011; Finkelstein and Hambrick, 1996).

The HumEnt as entrepreneurial behavior, therefore, is to be understood as the conjugation of the classic entrepreneurial strategic posture (i.e. risk-oriented, innovation and proactive action) with what the entrepreneur shows an orientation to sustainability (in broad sense) and how much it shows an orientation that enhances human resources (by including in this category both management and employees), compared to the company and the performance of the entrepreneurial function itself (Parente *et al.*, 2018). The term 'humane' therefore assumes a pregnant meaning since the notion of 'humane entrepreneurship' was born with the aim of analyzing the attention of the company and the Entrepreneurial function to local communities, the planet, the problems of society and the engagement of executive and employees (Parente *et al.*, 2018).

2.2 Sustainable Human Resources Management (SHRM)

Sustainable management of human resources (SHRM) has gained an increasing attention in academic research in the late nineties (Müller-Christ and Remer, 1999; Zaugg *et al.*, 2001; Gollan, 2000; Wilkinson *et al.*, 2001; Avery and Bergsteiner, 2011). Starting from previous research on environmental management, human relations and corporate sustainability (Ehnert and Harry, 2012), SHRM literature highlights the role of sustainability issue for the management of human resource. To date, a unique definition of SHRM does not exist and a fragmentation of related literature can be found. In this context, three different groups of studies can be distinguished based on the common assumption of sustainability as a long-term and durable outcome but characterized for a different vision about the relationship between sustainability and HRM. The first group highlights economic outcomes and the creation of "sustainable competitive advantage" and focuses on the internal effects of HRM policies (Wilkinson *et al.*, 2001; Ehnert, 2009; Clarke, 2011).

A second group of studies focuses the attention on external outcomes, considered in terms of an enlarged performance that includes environmental, social and human outcomes (Mariappanadar, 2003, 2012; Orlitzky *et al.*, 2003; Branco and Rodrigues, 2006; Collinson *et al.*, 2007). This group of research identifies a relationship between HRM and such external outcomes that represent typical elements of CSR and triple bottom line literature. The main assumption of this stream of research is that positive results in terms of social/human and environmental performance, represent a sort of strategic investment able to produce positive impact on economic performance and a means to satisfy expectations of different categories of stakeholders.

A third group - that is probably the largest and that includes the literature on sustainable leadership (Avery 2005) - investigates the relationship between HRM policies and environmental sustainability (Dunphy *et al.*, 2007) and emphasizes the direct connection between internal and external outcomes and HRM practices. Some authors in this stream (see Dunphy *et al.*, 2007; Renwick, Redman and Maguire, 2011) sustain that environmental and human/social outcomes are strictly related and contribute to the sustainability of organization. According to these studies, the implementation of environmental policies requires the development of HRM practices able to create trust between employees, the organization and the local communities in which the organization is

involved. Dunphy *et al.* (2007) sustain the necessity for firms to adopt specific management strategies for their staff in order to reach positive ecological/environmental outcomes. According to these authors, a sustaining organization is one “which fully incorporates the tenets of human and ecological sustainability into its own operations and also works to support the application of sustainability more widely” (Dunphy *et al.* 2007, p. 62). This kind of organization is based on strong corporate values and a large commitment of senior executive. At the same time, it is characterized for a flexible structure and HRM practices able to develop capabilities of employees, stimulate a participative decision-making context and promote high levels of workplace health and safety. Similarly, Jabbour and Santos (2008) focuses the attention on relationships between environmental management and HRM. In this context, expanding Strategic HRM, some authors include sustainability issues (Osland and Osland 2007; Kramar 2012) and emphasize the role of HRM on environmental outcomes such as pollution (Jackson *et al.*, 2011; Renwick *et al.*, 2011). A wide range of HRM policies related to employee management (attraction, retaining, training and rewarding) and in particular related to employee involvement, empowerment and engagement, have been defined to develop an environmental culture and related capabilities (Renwick *et al.*, 2011). In this context, some sustainable leadership practices, such as training and constant development, work relation improvements, the recognition of employees work, are also considered as relevant elements for a sustainable management of human resource (Avery and Bergsteiner, 2011; Jabbour *et al.*, 2008; Lozano and Huisinigh, 2011). What emerges from the analysis is that human resource management plays a key role for the environmental sustainability: it creates the condition to mobilize employees and promote changes in the work place and in the behavior of people (Dubois and Dubois, 2012). In sum, the different streams of research about SHRM highlight a conceptual multiplicity of the theme with particular reference to the issues of human resource management supporting organizational sustainability and sustainability practices (Cohen *et al.*, 2012; Ehnert *et al.*, 2013; Guerci and Pedrini, 2014). They sustain the role of human resource management in supporting business sustainability (Cleveland *et al.*, 2015) through the adoption of practices that could help people and groups, in the development of attitudes and behaviors consistent with a sustainable approach (Avery and Bergsteiner, 2010; Cohen *et al.*, 2012; Parkes and Borland, 2012). Such practices include the training and education for knowledge acquisition and development of abilities that contribute to the goals of organizational sustainability, organizational support to promote behaviors aimed at corporate sustainability, internal communication to reinforce the importance of corporate sustainability (Yang *et al.*, 2013; Cohen *et al.*, 2012; Jabbour and Santos, 2008).

In conclusion, within the current uncertain global economic, social and ecological climate, the literature on SHRM strongly needs to continue to evolve because it represents a new approach to managing people, by identifying broader purposes for HRM able to address the complexities of workplace and the need to avoid negative impacts of HRM practices.

2.3 Sustainability issues, CSR, and Employees' commitment toward sustainability

In a time where companies are ever more attentive to employees' attraction and retention and developing human resources is a unique form of competitive advantage (Zhou *et al.*, 2018), employees' commitment and their subsequent work behavior (e.g., job performance, employee health, labor turnover) (Harvey *et al.*, 2017) become really crucial. Even though the growing attention in CSR and financial performances of organizations (Mahmoud *et al.*, 2017), the influence of a variety of sustainability practices on firms' internal stakeholders (and in particular of employees) is still mostly under searched (Larson *et al.*, 2008; Mahmoud *et al.*, 2017). Due to the inconclusive findings resulted in the relation between sustainability practices and the overall performances of organizations (Harvey *et al.*, 2017; Luo and Bhattacharya, 2006), scholars suggest to pay attention to the influence of these practices on one specific stakeholder category - i.e. employees (Peterson, 2004; Harvey *et al.*, 2017;). Employees, in fact, are crucial for the success of

sustainability initiatives and the concept of employee commitment is therefore a constant challenge for firms (McInerney and Niewiarowski, 2022).

There is an extensive growth of CSR studies investigating its effects on a variety of stakeholders, such as suppliers, investors, governments, employees, consumers, and suppliers (Hameed *et al.*, 2016; Shen and Zhang, 2019; O'Connor *et al.*, 2017). Among all these groups, the human resource function is essential to any kind of CSR investigation (Aguilera *et al.*, 2007; Shen and Zhang, 2019; Mitonga- Monga and Hoole, 2018) even though the mainstream CSR research concentrates on external stakeholders such as customers and investors (Luo and Bhattacharya, 2006; Lichtenstein *et al.*, 2004), overlooking the significance of the workforce as a strategic and essential stakeholder group to any socially responsible organization (Larson *et al.*, 2008; Shen and Zhang, 2019). For decades, academics have inspected the influence of CSR efforts on financial performances of organizations (McWilliams *et al.*, 2006; Shen and Zhang, 2019; Mahmoud *et al.*, 2017). Moreover, the majority of studies have broadly deepened the relation between the effect of CSR activities on overall organizational performances in terms of sustainability, reputation and competitiveness (Johnson, 2003; Porter and Kramer, 2002). Nevertheless, academic analysis on the impacts of CSR and sustainability practices on employees' commitment is still narrow (Larson *et al.*, 2008; Kim *et al.*, 2017; Rodrigo and Arenas, 2008; Kim *et al.*, 2010; Turker, 2009).

In general terms, employees' commitment refers to "the intentions to behave in some way that is beneficial to the organization" (Sharma *et al.*, 2021, p. 21). Employees' commitment to the sustainability relies on their desire to take part in the environmental care of their organizations (Paille and Valeau, 2020). The concept of employees' commitment sustains the idea that the firms' "green goals" can be attained if the workforces are really committed to sustainable outcomes (Sharma *et al.*, 2021). Accordingly, scholarship has enlightened that higher levels of employees' sustainability commitment is directed to greater organizational performances (Owens 2006) and similarly increases firms' overall productivity. Most important, it has been emphasized that the management commitment towards environmental issues positively affects their employees' commitment (Aguinis and Glavas, 2012).

With specific reference to sustainability issues, employees' commitment toward sustainability is considered an essential component for renovating firms' sustainability mission, strategy, and values into measurable outcomes (Galpin and Whittington, 2012). In particular, starting from the idea that "employees are a company's best ambassadors for identifying and implementing innovative sustainability initiatives" (Veleva *et al.*, 2017, p. 520), some research has surveyed the relationship between CSR and employees' commitment finding that it significantly influences sustainability in enterprises (Markos and Sridevi, 2010; Saratun, 2015). Moreover, in the MSME context, evidences suggest that it is mostly the leader orientation to sustainability and the endeavors directed toward key human resources practices that promote and strengthen employees' engagement to sustainability (Mishra, 2017; Ehnert, 2014). Studies have also established that better employees' commitment is related to enhanced employees' retention and satisfaction on the workplace, firm profitability, organizational citizenship behavior and customer loyalty (Valentine and Fleischman, 2008; Veleva *et al.*, 2012; Markos and Sridevi, 2010).

3. Research Framework and Hypotheses development

Since sustainability practices often drives against firms' production goals, which might define employees' rewards, it is clearly problematic to engage managers and human resources, as they are fronting their own cost and time pressures. At the same time, researches confirm that the workforce is the firm's best ambassador for the identification and implementation of innovative sustainability initiatives (Veleva *et al.*, 2017; Du *et al.*, 2010; Sharma *et al.*, 2009; Mirvis, 2012). So, exploring the drivers of employees' commitment toward sustainability becomes crucial.

Educating and empowering human resources in identifying and supporting innovative strategies for sustainability goals is in fact critical for the success of any sustainability-oriented strategy.

Robinson *et al.* (2004) revealed that the key driver of employees' commitment is fostering in them a "sense of feeling valued and involved". Accordingly, the CIPD survey that involved a sample of 2000 employees in Great Britain found that communication represents the highest priority for cultivating employees' commitment. This includes not only "being kept informed about what is going on in the organization" but also providing opportunities for employees "to feed their views and opinions upward" (Markos and Sridevi, 2010 p. 90).

The importance of communicate sustainability has been examined in a greater detail by Kim *et al.* (2010). The scholars investigated the connection between employees' perception of CSR initiatives compared to those who actively participated in such activities and found that CSR communication has a direct influence on employees' identification with the corporate culture and thus is a more effective way for firms to preserve a constructive relation with the human resources. Mirvis (2012) identifies three different ways in which firms can better foster their workforce sustainable oriented behaviors: developing courses and specific programs to fulfil the requirements of workforces passionate about sustainability and promote actions to overall educate and empower human resources in taking sustainable actions in both their workplace and personal lives. Constant communication, education, training and empowering human resources to behave social and environmental responsibly are indeed critical.

Some authors (see e.g. Kramar *et al.*, 2014; Veleva *et al.*, 2017) have recently observed what could be the best practices, which management should follow for an effective and complete integration of sustainability objectives within the management of human resources:

- translating the environmental commitment into concrete communication actions towards employees with the aim of holistically changing the organizational culture;
- encourage the empowerment of workers by increasing their delegation and decision-making space, thus being able to be an active part of the company's evolutionary process;
- plan specific "environmental training" projects to train them
- communicate to the employees the environmental performance standards and indicators chosen by the firm in order to establish and promote an internal dialogue. Management can foster this performance by assigning specific goals to individual employees or work teams and providing them with regular feedback.

Employees' commitment to sustainability issues also relies on their wish to share and care about the environmental concerns of their company (Paille and Valeau, 2020). Hence, organizational sustainability goals can be attained if the employees are really engaged and committed. Importantly, it has been highlighted how the top management engagement towards the environment and sustainability issues stimulates their human resources commitment toward sustainability (Aguinis and Glavas, 2012). So we can argue that employees tend to be more committed when they perceive a concrete engagement of their organization in achieving green goals oriented toward sustainability, and overall sustainability practices.

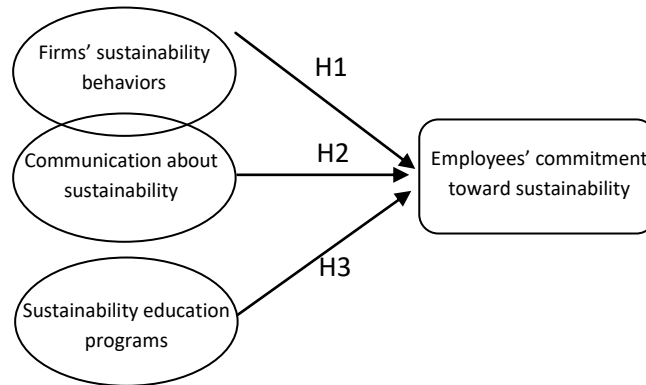
Moving from this literature we put the following hypotheses (Fig. 1):

Hp1: Firms' sustainability behaviors positively impact on employees' commitment toward sustainability

Hp2: Clarity of firm's communication about its sustainability performance positively impacts on employees' commitment toward sustainability

Hp3: Firms' sustainability education programs provision positively impacts on employees' commitment to sustainability

Fig. 1: Empirical model and hypotheses



Source: Authors' elaboration (2023)

4. Data and Method

To test the hypotheses of this study, a survey on employees of mechanical's firms located in the Province of Salerno (Campania Region, Italy) was developed administering to a convenience sample a paper-based structured questionnaire in April-May 2022. To boost the response rate and to ensure as much as possible the confidentiality of the data collected, respondents were not required provide their names for the survey.

Following Churchill (1979) and Kline (2005), all the measures in this study were measured with items adapted from the previous study of Veleva *et al.* (2017).

To assess employees' commitment toward sustainability, participants were asked to rate their current effort in achieving the environmental sustainability goals of the company on a 5-point Likert scale. To obtain a measure for clarity of firms' communication, employees were asked to rate on a 5-point Likert scale how clear they find the company's communication of its environmental sustainability goals. To assess firms' sustainability education programs provision participants were asked to rate on a 5-point Likert scale how important they feel is that their company offers educational and training events to reduce environmental impact and achieve sustainability goals. Finally, the employees' awareness of firms' sustainability behaviors has been assessed with four items respectively capturing how employees judge important or not important (on a scale ranging from 1=not important to 5=very important) that the firm put in place actions devoted to: (1) Use compostable materials; (2) Expand recycling programs; (3) Eliminate plastic use; (4) reduce energy consumption. To assess the psychometric qualities of the awareness measure, a principal component analysis with Varimax rotation was performed. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.79) and the Bartlett test ($p=.000$) provide assurance that the scale is homogenous and adequate. This is also confirmed by Kaiser's criteria (unidimensional measurement scale) and the explained total variance (75.12%). The reliability of the scale is also acceptable based on Cronbach's alpha (0.89).

Finally, the empirical analysis also considers a group of control variables that possibly could impact employees' commitment toward sustainability, namely education level, the role of the employee inside the firm and employees' monthly income (economic status).

To test the research hypotheses (i.e., the impact on employees' commitment toward sustainability of awareness of firms' sustainability behaviors, sustainability education programs, and clarity of firm's communication about its sustainability performance) OLS regression analysis was employed with SPSS Statistics. To assess multicollinearity, the variance inflation factor (VIF) of each independent variable was computed.

5. Results

At the end of the process 242 valid responses have been obtained investigating 14 mechanic's firms. Tab. 1 reports the descriptive statistics of our sample. The average age of respondents was 39.7 years, and approximately 88% of the sample were men.

Tab. 1: Descriptive Statistics (N=242)

	N.	%
Gender		
Male	214	88,4
Female	28	11,6
Education		
Primary School	40	16,5
Secondary school (classical)	18	7,4
Secondary school (technical)	92	38,0
Degree (social)	20	8,3
Degree (Technical)	60	24,8
PhD	1	0,4
Not Answered	11	4,5
Company Role		
Manager	12	5,0
Funzionario	3	1,2
Impiegato	95	39,3
Operaio	126	52,1
Not Answered	6	2,5
Monthly net income		
< 1.000,00 €	8	3,3
tra 1.000,00 e 1500,00 €	129	53,3
tra 1.500,00 e 2000,00 €	75	31,0
tra 2.000,00 e 2500,00 €	13	5,4
oltre 2500 €	3	1,2
Not Answered	14	242

Results of regression analyses are presented in Tab. 2. The variance inflation factor (VIF) computed for each independent construct in the model is under the threshold value of 3, indicating low multi-collinearity (Hair *et al.* 2010).

In the baseline model (Model 0), the control variables (education, company role, income) all load on the dependent variable. Results show that Education ($p < .05$) and company role ($p < .05$) have a statistically significant relationship with Employees' Commitment. In Model 1 all the explanatory variables were added resulting in firms' sustainability behaviors ($\beta=.188$; $t=2.013$; $p<.05$), clarity of firm's communication about its sustainability performance ($\beta=.202$; $t=3.864$; $p<.001$) and firms' sustainability education programs provision ($\beta=.172$; $t=2.191$; $p<.05$) to significantly and strongly affect employees' commitment toward sustainability. Thus, all the three hypotheses are finally supported.

Tab. 2: Results of Regression Analysis (DV: Commitment Toward Sustainability)

Variable	Model 1	Model 2	VIF
Education	.215* (2.509)	.106⁺ (1.790)	1.624
Company Role	.206* (2.336)	.235* (2.190)	1.710
Income	.026 (.360)	.025 (.267)	1.171
Sustainability Awareness		.188** (2.013)	2.132
Communication about Sustainability		.202*** (3.864)	1.096
Sustainability Educational Programs provision		.172* (2.191)	2.191
Constant	1.171 (1.339)	.455 (.547)	
N. Observ	242	242	
R ²	.035	.250	
Adjusted R ²	.021	.228	
F-Value	2.518 ⁺	11.377***	

⁺ p < .1 * p < .05 ** p < .01 *** p < .001. The figures in parentheses are t-values, VIF variance inflation factor

Source: Author(s) elaboration

6. Discussion

Recent research has widely acknowledged that the sustainable development of societies is no more possible without the sustainability commitment inside firms (Schaltegger *et al.*, 2012; Zink, 2014; Wagner, 2015) that nowadays must necessarily review their business models and find ways and techniques to address the reduction of ecological impact, focusing on environmental and social factors beyond the traditional economic and financial goals (Daily *et al.*, 2007). The theory also highlights the need for all the forces operating within the company to have the environmental issue concretely at heart, in particular for human resources to perceive the need for the role they play in supporting the change towards sustainability. In fact, human resources' is a function that has the greatest potential for including sustainability postulates in the organizational boundaries and in the company's mission itself and employees are considered the best ambassadors of a company to identify and implement innovative sustainability initiatives (Sharma *et al.*, 2009; Mirvis, 2012). Nevertheless, the effectiveness of CSR on the main internal stakeholders - employees -, has been under researched in literature (Jones *et al.*, 2017; Harvey *et al.*, 2017; Schons and Steinmeier, 2016; Kim *et al.*, 2010; Turker, 2009; Larson *et al.*, 2008).

Therefore, this paper moves from the theoretical lens of the HumEnt theory and the prescriptions from the SHRM paradigm to develop a framework to explain how the firms could better foster employees' commitment toward sustainability, focusing on a variety of both internal and external CSR practices.

Humane Entrepreneurship, grounding on the triple bottom line model of sustainability (Elkington, 1994), postulates that the entrepreneurial strategic posture, that is more in line with the challenges of the 21st century, requires new way of identification and exploitation of entrepreneurial opportunities based on a more direct involvement of internal and external stakeholders. Most important, Kim *et al.* (2018) identify employee commitment and engagement as an effective strategy for reaching organizational improvement, with a specific focus on empathy, equity, enablement, and empowerment of human resources. Shifting into a managerial perspective, the SHRM highlights the role of human resource management for the development of business

sustainability (Cleveland *et al.*, 2015), emphasizing the role of policies and practices aimed to stimulate attitudes and behaviors consistent with a sustainable approach (Avery and Bergsteiner, 2010; Cohen *et al.*, 2012; Parkes and Borland, 2012). In particular, this framework identifies some specific practices of human resource management able to contribute to business sustainability. Such practices include: the training for the acquisition of knowledge necessary to contribute to organizational sustainability; the creation of an organizational climate that stimulate sustainability practices; organizational commitment to CSR activities and internal communication about the importance of corporate sustainability (Jabbour and Santos, 2008; Cohen *et al.*, 2012; Yang *et al.*, 2013). For these reasons, both HumEnt and SHRM were deemed as suitable basis to develop our research framework.

In order to assess employees' commitment toward sustainability, our study take into consideration the effect of three different sustainability practices of the firms, analyzed through an individual perceptual level: the employees' perceived importance devoted to a number of sustainability practices of the firms (namely use compostable materials; adoption of recycling programs; elimination of plastic use; reduction of energy consumption) that synthesize the sustainable behavior of the firm, the perceived clarity of firms' communication about sustainability and the perceived importance of firms offering of educational programs devoted to improve sustainability knowledge inside the firm.

Results of the empirical analysis return us a general positive and significant impact of CSR practices on employees' commitment toward sustainability. In detail, in line with arguments from Aguinis and Glavas (2012) we found employees' perceived importance devoted to a number of sustainability practices of the firms to positively impact on employees' commitment, in the sense that employees tend to be more committed when they perceive a concrete engagement of their organization in achieving green goals oriented toward sustainability. Moreover, we also find the perceived clarity of firms' communication about sustainability goals positively impact on employees' commitment toward sustainability, in line with CIPD survey in Great Britain, which found that communication is the top priority for improving employee commitment. In fact, communicate to the employees the environmental performance standards and indicators chosen by the firm allows firms to establish and promote an internal dialogue; translating the environmental commitment into concrete communication actions towards employees reflects the aim of holistically change the organizational culture. Management can foster this practice by assigning specific goals to individual employees or work teams and providing them with regular feedback. Finally, we also found the perceived importance of firms offering of educational programs devoted to improve sustainability knowledge inside the firm to positively impact employees' commitment toward sustainability assessing how educating and empowering employees to identify and support innovative strategies for sustainability goals is a critical issue for the success of any sustainability oriented strategy (Veleva *et al.*, 2017). According with Mirvis (2012) developing educational programs to meet the needs of employees passionate about sustainability is a substantial way for companies to engage their employees in sustainable oriented behaviors.

7. Conclusions and implications

The contribution of this study is twofold. From a theoretical perspective the study stresses the need for paying more attention to the factors the drive the development of employees' commitment toward sustainability. More specifically our study contributes to CSR, Humane Entrepreneurship and SHRM literature in several ways.

First, considering the role of employees as the best ambassadors of firms for implementing sustainability initiatives (Mirvis, 2012; Sharma *et al.*, 2009; Du *et al.*, 2010;) the research advances scholarship on CSR providing insights about mechanisms and actions through which firms can develop a sustainability culture inside the organization. Second, following the suggestion of Hameed *et al.* (2016) in order to understand the mechanism that connects CSR actions and

employees' commitment toward sustainability, the study contribute to the literature highlighting the strong relationship between the behavior of firms in terms of sustainability and the employees' commitment. Third, the study adopts a perceptual approach expanding the body of knowledge in the CSR field supporting the idea that employee commitment is strictly linked with individual perception (Mahmoud *et al.*, 2017; Rupp *et al.*, 2013; Bridoux *et al.*, 2016).

In addition, the study contributes to the Humane Entrepreneurship Theory highlighting the relationship between entrepreneurship, leadership and Humane Resource (Kim *et al.*, 2018). In particular, having identified the positive impact of some sustainability practices of the firms on employees' commitment, our research provides evidences about the basic idea of Humane Entrepreneurship theory that "the actions of leaders not only impact entrepreneurial culture, but substantially affect individual and organizational performance through the culture they have constructed" (Kim *et al.*, 2018, p. 25). Moreover, our findings support the core HumEnt idea that sustainability actions are strictly related with employees' engagement and commitment (Parente *et al.*, 2018; Vesci *et al.*, 2022).

Finally, the study contributes to SHRM literature and in particular to the specific streams that highlight the necessity for firms to adopt *best practices* that can encourage individuals and groups in exploiting attitudes and behaviors consistent with sustainable approaches (Parkes and Borland, 2012; Avery and Bergsteiner, 2010; Cohen *et al.*, 2012). In this perspective, our research shows that some sustainability practices of the firms, specifically the clarity of firms' communication about sustainability and the importance of firms offering of educational programs devoted to improve sustainability knowledge inside the firm, could represent effective practices to develop sustainability oriented employees.

Regarding practical contribution, our study helps managers and entrepreneurs in defining effective approach to advancing employees' commitment toward sustainability. In particular, our research suggests that an effective approach of firms must include three elements. First, firm could engage employees through continuous and clear communication of its sustainability performance. Second, an effective approach must include programs aimed to educate employees about sustainability issues. Third, it must include a clear effort of firms expressed through actions and behaviors related to sustainability.

This research paper is subject to some limitations. First, we studied a sample of exclusively firms located in small regional area, which limits the scope of interpretation of our results to the countries or regions that can be compared to the Province of Salerno ecosystem in terms of legislation, regulation, and culture. By expanding primary data tailored even more to the purpose of the study, future research projects could shed more light on the impact that identified drivers have on employees' commitment toward sustainability. Second, in this study, we primarily focus on the firms' sustainability education programs provision. In the future research could take a more holistic view on the educational process referring to the effectiveness of the educational process and not only to its availability inside the firm.

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Exploring the Drivers of Sustainable Transformation in Corporations: Deliberate Change or Unconscious Shift?

MARGHERITA MILOTTA*

Abstract

Framing of the research. *The importance of sustainability in business strategies is increasing, and companies must act, which may be easier than expected. While external factors can trigger transformations in sustainability, internal input can also drive change. Unconscious adoption of a green culture within a company can lead to transformation.*

Purpose of the paper. *This discussion aims to explore whether the theory that transformation is either deliberate or the result of an unexpected event, as contrary options, can be applied to sustainable transformation. The focus is on taking a holistic view to understand the implications of transformation and identifying the key factors and resources that companies utilize to transform.*

Methodology. *The research will concentrate on a sector with significant resource consumption and pollution levels. Using qualitative research methodology and analyzing case study, following the Gioia methodology.*

Results. *Develop a conceptual framework for sustainable transformation dimensions and a route for successful implementation that companies can undertake.*

Research limitation. *The study is focused on a specific industry and related to a single type of transformation: sustainable one. Leaving space to investigate in other transformations or industries.*

Managerial implication. *The study makes it possible to identify key elements that can be a guide in pursuing sustainable transformation as a goal.*

Originality of the paper. *The questioning and subsequent analysis of the case lead to a contrasting opinion with what is believed in the literature. Going on to identify unusual features for a transformation such as awareness.*

Keywords: *transformation management; green culture; creating awareness; social sustainability; environment*

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1. Introduction

Sustainable transformation within a company refers to the process of implementing long-lasting changes that, not only improve its operations and profitability, but also take into consideration the impact on the environment and society (O'Brien, 2012). In today's business landscape, companies are increasingly aware of the need to shift towards more sustainable practices, both to meet customer demand and regulatory requirements, but also to ensure their future viability. Implementing sustainable transformation requires a comprehensive approach that involves rethinking and modifying processes, systems, and culture to create a more sustainable business model. Every company must deal with an environment that is constantly changing and evolving, so it must be prepared to react appropriately to these stimuli. Indeed, the business world today is characterized by frequent changes and navigating it can be complex due to the interrelated and interdependent nature of various elements, each with its own set of stakeholders and objectives (Uhl and Gollenie, 2016).

With the growing concern for the environment and people, the integration of sustainability into business strategies has become a critical aspect. The intersection of transformation and sustainability has led to the emergence of "sustainable transformation" as a research area of interest in recent years (Abson *et al.*, 2017). Despite the popularity of the term "sustainable transformation", it is a complex and ill-defined concept, making it crucial to have a clear understanding of its core components, implementation process, and consequences.

In the literature, it is believed that transformation can be of two types: "deliberate" or "the outcome of an unexpected event", and these are considered as contrary options. The aim of this paper is to investigate whether this also applies to sustainable transformation or if they are two facets of the same phenomenon. Furthermore, this paper delves into an examination of how a multinational steel production company has taken steps towards sustainability. Using a business case study, the paper highlights the transformation process in an industry known for its high levels of pollution. By applying the Gioia methodology, it focuses on identifying the crucial elements of this change and understanding how they work together to achieve successful transformation. It also explores the potential for latent actions to contribute to sustainability by raising awareness. As stated by Davenport (1993), a transformation process is made up of multiple components that must function in harmony to achieve success.

The paper is structured as follows: the first section provides an overview of the theoretical basis of transformation management, the distinction between change management and transformation management, which serves as a starting point for our research. The second part outlines the applied methodology and research subject. Lastly, the study presents the findings and a discussion of the results.

2. Theoretical background

2.1 Change management as predecessor of Transformation Management

Change management can be considered a predecessor of transformation management, and to understand the subtle but stark difference it can be done through a metaphor of Wilber (1983) who compares "change" to moving furniture on the floor and "transformation" to moving furniture to a new floor.

Therefore, trying to deepen "transformation" one may depart from established concepts as "Change management". It could be defined as 'the process of continually renewing an organization's direction, structure, and capabilities to serve the ever-changing needs of external and internal customers' (Moran & Brightman, 2001). According to Burnes (2004), changing is an ever-present characteristic of life in an organization, both at the operative and strategic levels. Hence, there

should be no doubt about the importance to any organization of its ability to identify where it needs to be in the future and how to manage the changes necessary to get there.

The nature of change has increased its importance in recent years: if before they were just transitional events that had to be managed, now it is becoming a more radical, complex, and continuous concept, so it is referred to as “transformation” (Uhl and Gollenie, 2016). Driving change needs the integration of numerous cross-functional projects since we could no longer speak about separate change initiatives, because one change now had an impact on the entire organization and beyond (Anderson and Anderson, 2002).

Transformation is a watchword nowadays for most of the organization in order to survive to both exogenous and endogenous changes (Uhl and Gollenie, 2016). Hence, from one side there are external variables, as sustainability, technological innovation, globalization and economic conditions (Arthus and Busenitz, 2006; Eisenhardt and Sull, 2001); on the other hand, endogenous variables and product innovation, business models restructuring and change in workforce attitudes (Eisenhardt and Bourgeois III, 1988). From an academic point of view, the literature has focused on several operational frameworks that, however, lack certain concepts in mainly on how to link the key elements of change in order to achieve a coherent and effective transformation, particularly when it comes to deal with the complexity that a transformation project inevitably entails.

Every transformation process is fragmented, made up of multiple elements as changes in organizational structure, outsourcing, supply chain reorganization, and creation of novel business models. However, the connections between these elements are not developed or articulated, or they become blurred as business transformation progresses, particularly for the people who are its recipients (Davenport, 1993).

The problem of disconnected elements stems from the assumption that change is linear and a unitary process or routine (Uhl and Gollenie, 2016). Instead, business transformation is not a single entity routine, but a meta-routine, representing a set of different procedures that must be joined together to function properly (Pentland *et al.*, 2012).

Since the assumption of linear change, no more the case, new insight is necessary, new approaches. Latest views described transformation management as “the holistic management of extensive, complex changes on which the organization’s future success strongly depends” (FHNW, 2012).

2.2. Two types of transformation: deliberate vs unaware

Transformation might mean different things to different people or groups. It is not always evident exactly what has to be transformed and why, whose interests these transformations serve, and what the repercussions will be. Some people believe that the concept of transformation offers potential for innovation, the development of renewable materials and technologies, and the creation of “green” economies (Barbier, 2010). Additionally, it offers opportunities for questioning the global financial system and persistent economic growth and consumption assumptions (Jackson, 2009). Others believe it portends a restriction of freedom that will lead to anarchy and commotion.

It can be viewed as harmful by some and helpful by others, resulting in conflicts and trade-offs that can produce real or perceived winners and losers at various scales (O’Brien and Leichenko, 2003; Pelling, 2011). It is possible to distinguish between transformation as a planned process and another type of transformation that results from an unplanned or unintentional activity or circumstance (Nelson *et al.*, 2007).

Many times, intentional transformations are carried out for the purpose of achieving a specific goal. Such transformations are also known as “directional transformations” or “purposeful transformations” (Chapin *et al.*, 2009; Berkhout, 2002). It is about realizing that some fundamental adjustments are necessary for the realization of desired futures, rather than social engineering or “creating” the future (Miller, 2007). Although there are many different views on what a good future should look like, there are numerous normative justifications for putting both ethics and sustainability first (Irwin, 2010).

The adjustments required may include a range of technological advances, institutional reforms, behavioral changes and cultural shifts; they often involve questioning presumptions, values and the ability to thoroughly examine established beliefs, identities and stereotypes. Small, dedicated groups of people often initiate deliberate transformations, sometimes working in shadow networks (Olsson *et al.*, 2006; Pelling *et al.*, 2008). However, to be effective, entrenched systems, supported and protected by powerful interests, must often be changed. Consequently, there are significant barriers to change that are grounded in culture and cognition and manifest in economic and social policies, land-use laws, resource management practices, and other social institutions and customs (Kegan and Lahey, 2009; Moser and Ekstrom, 2010; Pelling, 2011; Shove *et al.*, 1998). In reality, both in the modern and postmodern eras, transition has been a central issue in social science study, coupled with philosophical ideas about the function of people in change processes (Polanyi, 1944; Boudon, 1986; Turner *et al.*, 1990). However, it is unclear if these several lines of inquiry are enough to guide policies and activities for purposeful, moral, and sustainable transformation at the pace and scale thought to be required to prevent harm to mankind. A lot of the boundaries between disciplines and methods may need to be removed in order for new questions to be raised and bolder solutions to be offered.

2.3 Sustainability and sustainable transformation

Since the current development trajectories are impacting the living conditions of humanity, sustainable transformation has been put forth more and more as a tangible future vision for civilization (IPBES, 2019). Concerned scholars have been highlighting the urgent need for sustainable change for more than ten years (Kates *et al.*, 2001; Clark, 2001; Swart *et al.*, 2004; Donges *et al.*, 2017). They understand that these changes necessitate both radical and systemic adjustments to societal norms, attitudes and beliefs, and multi-level governance and management structures.

Despite being relatively new, the idea of sustainable transformation relies on a long history of study in many domains that emphasizes social and environmental change in order to address serious global challenges including food insecurity, global warming, biodiversity loss, and widespread poverty (Dentoni and Bitzer, 2015; Grant, *et al.*, 2012). This has led to the emergence of several conceptual definitions (Feola, 2020) and methods (Caniglia, *et al.*, 2017; Sengers *et al.*, 2019).

Sustainability transformation combines the ideas of transformation with sustainability. In terms of their definitions, applications, and evaluations, both concepts provide special situations. In the literature, the concept of sustainable transition is frequently utilized, however transition and transformation are frequently used interchangeably (Salomaa and Juhola, 2020). The way to distinguish between these two ideas is to think of a transition as a steady process of change that need not be drastically different from the previous state (Geels, 2002), but a transformation would need a fundamental shift.

Instead, although the transdisciplinary nature inherent in the concept of sustainability, a widely adopted definition of sustainability is that developed by the planet Commission on Environment and Development and WCEED (Brundtland, 1987): “Sustainable development is development that meets the requirements of the present without compromising the ability of future generations to meet their own needs”. In this context, it is worth noting that concepts such as cleaner production, social responsibility, and eco-innovation contribute to meeting the sustainability guidelines, during which issues of environmental awareness and sustainable consumption of natural resources and human capital reinforce a more sustainable future (Severo *et al.*, 2018). Additionally, cultural aspects must even be considered, as they play a crucial role for companies to achieve the transdisciplinary concept of sustainability (García-Morales *et al.*, 2008; Roscoe *et al.*, 2019).

During this sense, Biswas (2018) emphasizes the importance of the Triple Bottom Line (TBL) for an adequate understanding of the size of sustainability. Initially created by John Elkington, the TBL (“people, profit, and planet”) has played a crucial role in the search for an understanding of sustainability. In other words, for a corporation to be considered sustainable, additionally to being

profitable, it must take under consideration in its decisions the social and environmental impacts of its actions (Biswas *et al.*, 2018; Depken and Zeman, 2018; Zhang *et al.*, 2018). The exemplification of those dimensions becomes clearer when considering the corporate sector. From the attitude of the social dimension of sustainability, organizations have to be concerned about the various stakeholders of their activities, starting from employees and customers to the communities surrounding their facilities. In other words, to be socially sustainable, companies must take responsibility for the well-being of those stakeholders (Burki *et al.*, 2018; Kaur and Sharma, 2018).

Looking instead at economic sustainability, it is first and foremost a matter of reducing the impact that companies have on the planet, aiming to reduce emissions but also the waste of raw materials. At first, companies tend to reluctantly adhere to regulations to reduce pollution. However, when process' analysis reveals economic waste to engineers and business decision makers, this brings attention to opportunities to redesign processes so that operations are not only cleaner, but also more efficient. This has a dual aspect: both that of reducing environmental impact but also a return in terms of economic sustainability (Rogers and Hudson, 2011).

3. Methodology

The study of sustainable transformation is a complex topic that requires an holistic view to understand it. This research aims to investigate the challenges that companies face during a sustainable transformation process, and to identify the key drivers and resources that enable the transformation to occur. The paper also questions the assumption that transformation can only be either “deliberate” or “an outcome of an unexpected event” aiming to understand if these two types can coexist.

A qualitative research methodology was used in the empirical study because there is limited understanding of this topic, and the analysis of transformation processes requires capturing even the smallest details, which only qualitative research can achieve. The primary data was collected through individual interviews with people from different departments within the company, to obtain a comprehensive view of the transformation process. The interviews followed a semi-structured guideline and lasted between 30 and 60 minutes, and the data was later cross-checked with secondary sources such as company information and online resources.

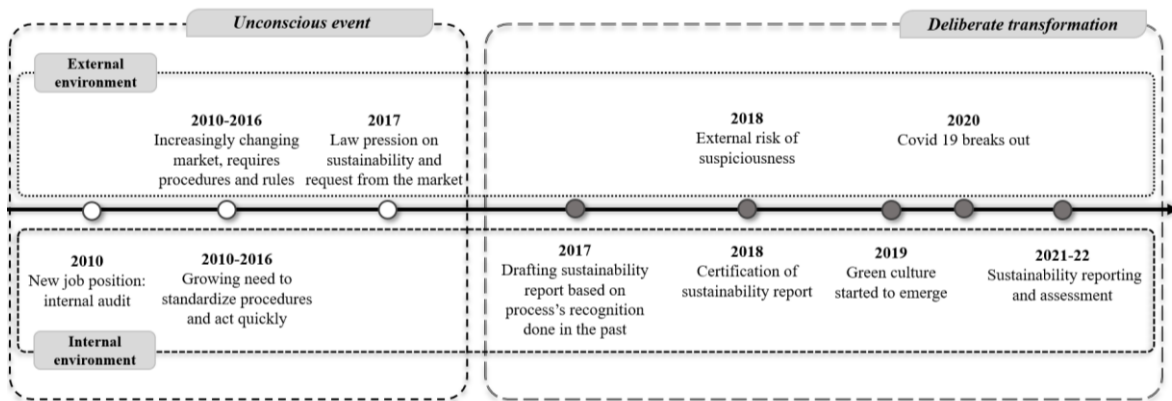
Gioia's Methodology was applied to analyze the data, which is a systematic approach to creating grounded theories through inductive research. The methodology includes a “First Order Analysis” which is useful for trying to reorder the large quantum of data collected so as to gain data that are easier to deal with; a “Second Order Analysis” to reorder the collected data, observe differences, and identify patterns and themes. The final step is to generalize the categories to reach the “aggregate dimension” (Gioia *et al.*, 2013).

The company chosen for the analysis is a multinational that manufactures and distributes stainless steel products. It operates in a highly polluting and resource-consuming industry, making it interesting to study how sustainable transformation can occur in such a sector.

4. Findings

The conduction of the interviews allowed to track and illustrate the path conducted by the company through all its transformation process. It was a process that lasted many years and in the next chart we can see the key moments (Fig. 1).

Fig. 1: Transformation Journey (Own Elaboration)



Source: (Own Elaboration, 2023)

The company analyzed is in continuous evolution, implementing frequently new projects, as the implementation of a lean structure, digitalization process etc., to analyze and know each part of the organization, being able to act whenever is needed. In the transformation process, it can be seen how both external and internal needs have been considered in corporate strategies to change. This reflects the fact that transformation is not only necessitated by causes external to the organization, but internal motivations may also lead to the realization that change is necessary in order to move forward.

In 2010, there was the creation of a new function: internal audit. The process was triggered by the need to implement an internal control of processes and establish common rules and regulations to apply to the entire organization in order to create a framework to align procedures. This need was reinforced by the increasingly changing market conditions in which the company operates. Therefore, defined procedures allowed the company to be quick and know in advance how to act.

Indeed, it should be emphasized that although the literature suggests that change often originates from endogenous and exogenous variables that cannot be planned in advance (Uhl and Gollenie, 2016; Arthus and Busenitz, 2006; Eisenhardt and Bourgeois III, 1988), actions in response to it can be though. A company therefore with robust structure, processes and procedures will be ready to respond to the unexpected event should it arise, planning actions in advance of hypothetical future events.

In 2017, sustainability concepts emerged within the company when, especially, the CEO recognized the need to introduce it. Laws and regulation on sustainability and market requests were becoming very present in strategies more and more importance was given to sustainable products. The CEO identified the Administration Finance and Control division as the area that could draft it, and he gave the responsibility to the person who was in charge of the internal audit since she had done internal audit for seven years and knew the company and business processes cross-functionally. It was, also for another reason, a smart move: ESG reporting includes sustainability in a holistic way, across all functions, spreading it in a quasi-automatic way throughout the organization.

In this first moment, however, sustainability consisted just of communication in terms of the redaction of the report. The company decided not to certify the first year precisely because it was a test to see whether it already had all the information to do a proper certification of the sustainability report, less than capturing how the performance was set up, but whether it already had all the information to do then from the following year a proper certification of the sustainability report.

In an industry where companies are seen as 'big and dusty', the suspicion of greenwashing can arise. In 2018, the company, to give proof or its credibility to its stakeholders decided to externally certify its sustainability report.

One year after, during the preparation of the sustainability report but also in the year ahead, they became aware of a pre-existing green culture in the company that had not yet fully emerged up to

that point. In fact, during the process of consolidating information to compile the report, they realized by looking at actions taken in the past that some existing projects could be read in a sustainable light, even though that was not their original purpose.

For example, the company, when scrutinizing existing processes and projects, it realized that many of them were sustainable, even if they were born and implemented for different purposes. Projects aiming at the reduction of raw material and energy that were initiated earlier on, had already started to contribute to sustainability, rather ‘unconsciously’.

Projects aiming at the reduction of raw material and energy that were initiated earlier on, had already started to contribute to sustainability, rather ‘unconsciously’. In fact, although their initial aim was to save materials, this however had a twofold aspect read from a sustainable perspective: economic sustainability but also environmental sustainability since the use of materials was reduced by optimizing processes and achieving the same result.

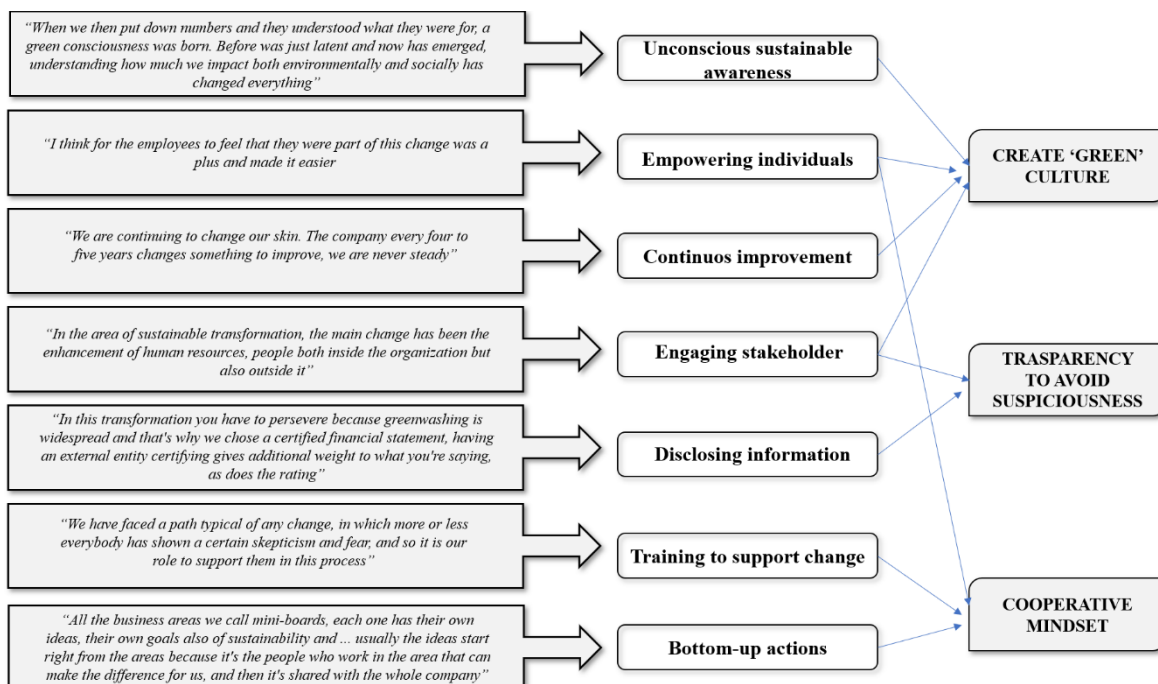
In 2020, when the pandemic appeared and everyone stayed at home, the company was paralyzed. In that year, with isolation at home, the head of sustainability in doing budgeting, noticed how the only effort in those years of change had been reporting activities without ever being proactive elements of sustainable change, this awareness triggered the need for substantial transformation.

At that point the CEO, fully embraced the idea of taking active action, so after the approval of the 2021 sustainability report, he decided to do an ESG assessment by a rating company and in 2022 they would do the actual rating. Therefore, they start to disclose their actual performance.

From this overview of the transformation process, it is possible to see how a process that was initially created for needs unrelated to sustainable transformation, such as process optimization, has since become the subject of a deliberate transformation toward sustainability. For this reason, it can be considered that the options highlighted in the literature as alternatives (O’Brien, 2012) are actually sides of the same coin.

After describing the different steps of the sustainable transformation, the application of Gioia’s methodology shows how this pattern was assembled brought different macro-aggregates which are illustrated in Fig 2.

Fig. 2: Gioia's methodology



Source: (Own Elaboration, Source: (Own Elaboration)

The first macroaggregate is "**create 'green' culture**" a recurring theme during the interviews. The company realized how simple daily actions, aimed at saving raw material consumption or

paying attention to the well-being of workers, led to pursuing sustainability goals, albeit not explicitly. This aspect is composed by sub-themes, that will be analyzed in deep.

‘Unconscious sustainable awareness’ is one of the most important findings of the paper. Companies often believe that the actions needed to implement a transformation are countless and complicated, neglecting that they could already be implementing the changes in everyday actions, unknowingly.

Inside the company, this aspect was recognized as an element of transformation. By simply implementing actions aimed at process optimization, thus unknowingly reducing the use of raw materials, they were already taking a step toward sustainable transformation.

The sustainability manager, for example, expressed this in the following way:

“...so automatically controlling and reducing consumption directly improves business efficiency, indirectly also improves sustainability...”

Actions may seem unrelated to transformation, but the real moment of transformation occurs when people finally hear the alarm bells, which involves a change in their awareness and beliefs. As the sustainability manager said:

“When we put down all the numbers and they understood what they were for, a green consciousness was born that was only latent before and has now emerged”

This awareness on the part of leaders and people, as well as their understanding of what is necessary to move forward, points to the initial and crucial change of mindset.

This change creates the internal conditions for leaders to consider new ways of responding to external challenges. They begin to generate creative ideas about what is achievable and necessary for the success of the organization and its people. Leaders who use a reflective approach are more aware of what transformation requires and the strategic alternatives accessible to them (Dionne *et al.*, 2004).

‘Empowering individuals’, the second dimension is an aspect related to the creation of ‘green’ culture in the sense that each person inside the company has to be fulfilled and must be given the opportunity to contribute to the company’s growth. However, this aspect is also related to the third dimension identified by the Gioia methodology, ‘cooperative mindset’. This aspect is relevant since it relates to one of the most essential resources for the company, its people. They are key for running the business and especially so as a driver of change. This is stated directly by the head of human resources HR:

“Paying attention to the individual employee, from the first to the last in the hierarchical ladder, has allowed us to better understand what each person's needs are and to try (as far as possible) to meet them”

An essential element that emerged from the analysis of the interviews is the total participation of all employees in business transformation. The company dialogues with and informs every hierarchical level, empowering them to live the transformation, and making them feel an active part of the change.

An effective explanation of how employees are deployed in the stages of transformation can be extracted from the words of the sustainability manager:

“In the sense that all the business areas we call mini-factories, each one has its own ideas, its own goals also of sustainability, and the function that I have been entrusted with is to trigger that virtuous circle where an area starts with an idea of sustainability, which usually starts right from the areas, because it is the people who work in the area who can make a difference for us and then it is shared with the whole company.”

“I believe that for employees to feel that they are part of this change has been a benefit and made it easier.”

Viewing each business area as a settling mini factory but considering each as part of a larger organization confirms what is described in the literature, that the transformation process is not a single routine but a collection of different routines (Pentland *et al.*, 2012).

Understanding the importance of people and knowing how to value them becomes an added value for companies, as employees first develop a sense of belonging and as a result, they will perform work no longer just as an obligation; secondly, they will feel gratified and an active part of the change. Importantly, this posture underlines the social dimension of sustainability, in the sense of well-being in the workplace and feeling part of a bigger goal.

When it comes to environmental impact one is often led to think that this must necessarily be reduced by taking sustainability actions, which is partly true; however, by analyzing the company in depth, it will be possible to see how simple actions, not based directly on sustainability goals, contributed to a latent awareness that only emerged after time.

The third item is ‘Continuous improvement’, the company’s ability to improve and learn useful lessons from the past, is a characteristic that has distinguished it over the years. This aspect came up frequently in the interviews, being considered by all interviewees one of the winning elements. An expression that embodies this key feature of the company culture came from the interview with the sustainability manager, and by quoting her words directly, the essence of this variable can be captured by her words:

“We are continuing to change our skin. The company every four to five years changes something to improve, we never sit still”.

From the intersection of several answers, it was possible to understand how this characteristic encapsulates a concept intrinsic to the industry in which the company operates: lack of flexibility. Flexibility not understood as adaptation to change or the ability to react, rather than to the implementation of transformational strategies within the entire supply chain. This aspect was described by the Sustainability manager:

“Steel companies are inflexible companies, not inflexible? in mentality but rather inflexible? in management. In fact, the difficulty in our case is that we cannot implement a revolution but need to proceed in small steps. So, the process is to start analyzing the possible efficiencies that there may be in one area and then slowly go downstream”.

Despite the difficulties in implementing transformation, it has been able to move forward in small steps, analyzing what has been done each time, to try to draw positive lessons to be applied in future actions. The willingness to continually challenge itself has allowed the company culture to be strengthened, never backing down or being afraid of change. This aspect is a shared value within the company, from top managers to workers, which enables day after day to improve business efficiency toward the achievement of increasingly ambitious goals.

‘**Transparency to avoid suspiciousness**’ is the second macro-aggregated derived from the data analysis. This pillar has to be understood as the two faces: disclosing information externally, being transparent to avoid ‘suspicion’, and engaging stakeholder in the sense that all of them can be informed or can know how the company is working and what the company is doing on sustainable objectives, not only outside the company but also people inside of it.

When a company achieves important sustainability results, suspicions may arise that these are exaggerated - the key to silencing these suspicions is transparency.

Over the years, the company has had to cope with doubts about the reality of its achievements that were related to prejudices regarding the highly polluting industry in which it operates. As the Sustainability manager said:

“... Thinking that a steel factory can do sustainability or just aim for resource optimization is viewed with suspicion, and I can understand that we are big, ugly, dusty, I understand the suspicion”.

“This (sustainable) change is also a cultural change and as such, it needs time, you have to persevere because the suspicion is so strong. Greenwashing is widespread and that's why we chose a certified financial statement, having an external entity certifying gives additional weight to what you're saying, as does the rating”

Efforts in demonstrating commitment to the community pay off, however, when all information is provided with complete transparency to the outside world, while also admitting room for improvement on aspects that are not yet fully performing, stakeholders understand and support the effort.

Finally, the third macro-aggregate is “**cooperative mindset**”. Within this concept can fall a variety of topics, the most relevant ones extrapolated from the interviews can be summarized in two main aspects: training to support change and bottom-up action.

Training is an essential tool to help employees create awareness, understand why change is needed, and actively contribute to make it happen.

In the company, change processes, especially the first ones to be implemented, were met with some skepticism and retrospection, but this never allowed the change to conclude. The total number of hours of training stood at 19,949 total hours, 2.5 times the training hours provided in 2020, bringing the training hours per person to more than 18 hours.

This aspect can be viewed reporting answered collected during the interviews, particularly with Human Resources manager and Sustainability manager:

“We have faced a path typical of any change, in which more or less everybody has shown a certain skepticism and fear, and so it is a path that has lasted for years and is still ongoing...”

“...The company in 12 years has changed so much. Because creating an internal control system means creating rules, norms that everyone has to follow, and when you go to change.... There was an old book called who moved my cheese, when you change even a semicolon to a person who has always done that for so many years, the first reaction is NO, it's human to ask: I've always done it this way why should I change?”

People are often reluctant to change, afraid of the unknown and of what may happen in the future. This, however, can be countered by making the concept of “continuous improvement” enter the company, effectively explaining why change is necessary and accompanying employees in this process. Citing Human Resources Manager:

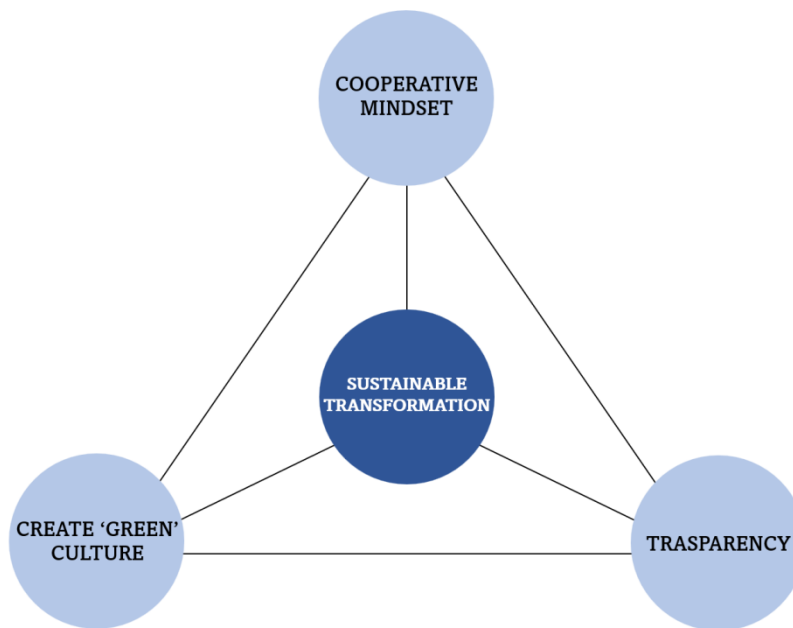
“...support that the company has given towards its employees, listening to perplexities, questions, issues and putting in place the right actions in order to be able to justify such an important transformation and above all to support each individual in this journey”

Inside the organization, the mindset of employees has changed over the years, accepting change with greater positivity and involvement. This was clearly seen in the implementation of sustainable transformation, in which people had already been trained and educated on how and why to implement change and reacted positively to yet another transformation phase.

The second aspect of this macro-aggregate was partly seen in a point earlier. The fact that individual areas are considered ‘mini factories’ giving them decision-making autonomy on how to achieve the goal set by managers is a way that reflects this action that starts directly from the bottom. Certainly, the strategic management maintains a top-down logic, however, it only defines the final goal but the way through which to achieve it is decided by the employees in the individual areas.

To summarize, we can say that sustainable transformation has changed the company in many aspects above mentioned. The following figure is useful to have a conceptual idea of what has been discovered from the research and understand what are the key drivers and resources that allow the transformation to take place (Fig. 3)

Fig. 3: 3-Legged Sustainable Transformation



Source: (Own Elaboration, 2023)

Business transformation, as we have seen in the literature, is not a unitary routine, but it can be considered as a combination of different procedures that must be joined together to function properly (Pentland *et al.*, 2012).

Sustainable transformation is a process of change aimed at creating a more environmentally friendly and socially responsible future. To achieve this, it is important to focus on three key pillars: green culture, transparency, and a cooperative mindset.

Green culture refers to the creation of a widespread understanding and appreciation of the need to protect the environment and conserve natural resources, but also respect people. This involves promoting environmental awareness and encouraging individuals and organizations to adopt more environmentally friendly practices.

Empowerment of individuals is one aspect of this analysis. This includes the provision of education and training, as well as access to resources and tools to help them make sustainable choices in their daily lives, but most importantly it has created opportunities for people to play an active role in sustainable transformation.

A cooperative mindset is essential for successful transformation. This means creating an environment of collaboration and cooperation between individuals, organizations, and communities, with a shared goal of creating a more sustainable future.

Finally, transparency is critical to avoiding suspicions of greenwashing. This means being open and honest about environmental impact and sustainability efforts, and taking steps to ensure that claims about environmental responsibility are supported by concrete actions and evidence.

In conclusion, sustainable transformation requires a comprehensive approach that combines all these aspects to ensure that our efforts to create a more sustainable future are credible and effective.

5. Conclusion

The growing importance of corporate sustainability has created a demand for companies to undergo a transformation process that requires time and resources. Companies must integrate environmental, social and economic goals into their business plans. A well-defined action plan is crucial, as sustainable transformation is not achieved by one action, but rather is an ongoing journey (Müller and Pflieger, 2014). The transformation process is composed of several elements

(Davenport, 1993), and understanding their interconnectedness can help study the transformative journey.

Additionally, both the Brundtland Report and the concept of the triple bottom line support the notion that sustainable development requires a balanced approach to all elements or pillars, as they are interdependent but not interchangeable (Figge *et al.*, 2001).

The aim of this paper was to understand, first, whether what the literature states can also be valid in the field of sustainable transformation, namely that transformation can be of two types ‘deliberate’ or ‘outcome of an unexpected event’. However, these could also be not two alternative options but sides of the same coin. Second, how this transformation process takes place within a company and what elements contribute to the success of the process. The company under investigation is in the steel sector, historically known for its high levels of pollution and resource consumption. To assess the company’s sustainability journey, a qualitative research methodology was employed, utilizing both primary data obtained through interviews and secondary data supplied by the company. The information was then analyzed using the Gioia methodology (Gioia, 2013) to create a conceptual framework that encapsulates the essential aspects.

The analysis of the business case showed that sustainability can be achieved through small and simple actions. The company adopted a comprehensive sustainable strategy that included social, environmental and economic aspects, recognizing the importance of sustainability in all its forms. The transformation was holistic and extended to all business processes, making it a transformation, not just a change. This process was only possible with the right resources.

Firstly, recognizing and looking at the actions taken but from a sustainable perspective was a key factor in bringing out the unconscious sustainability (Roger and Hudson, 2011). The company through a simple action such as reducing raw material, was able to achieve a dual purpose: that of environmental sustainability but also economic sustainability. This brought to a creation of a ‘green’ culture, starting as an unconscious action then becoming a deliberate transformation.

However, the first aspect is something that subsequently requires general commitment and involvement, which is only possible if people understand the importance of such actions. Therefore, transparency is another important pillar that should not be underestimated both to reinforce and create a shared culture and to reduce the suspicion that can arise from the contradiction that a polluting company can also be sustainable.

The field of sustainability and its implementation in companies is a vast area for future research and comparisons across various industries. It would be intriguing to study how different companies handle transformations and to determine if common approaches exist. Additionally, it would be valuable to examine how a single company manages and implements various types of change to determine if similar techniques can be applied elsewhere. The crucial takeaway is that companies must embrace change and not be afraid of failure. Instead, they should welcome internal and external influences to drive continuous improvement.

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Challenges and opportunities of digital nomadism for minor tourism destinations: the case of Valsugana (Italy)

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Abstract

Framing of the research. Starting from the definition of digital nomadism and its consequences for the destinations, the study debates on sustainable tourism development opportunities for minor destinations.

Purpose of the paper. Identification of enabling factors that contribute to the establishment of a destination for digital nomads and analysis of the stakeholders' perceptions about the impact of digital nomadism for the local development.

Methodology. The research adopts the case study method. An explorative study was conducted through eight interviews with key stakeholders, analyzed with a thematic analysis.

Results. If the coworking and Internet infrastructure are enough developed, the target of digital nomads is interesting for minor destinations that align with the principles of sustainability. Tourism products focuses on this new segment are still no defined.

Research limitations. Our study is limited to one case study. Nonetheless, Valsugana (in the Autonomous Province of Trento, Italy) is representative of minor tourism destinations that are facing stagnation and high seasonality, and considers sustainability as the starting point from which to re-define destination management strategies.

Managerial implications. The research shows the roles of key stakeholders and gathers views and expectations about this new phenomenon identifying structural, cultural and socio-economic factors, as well as opportunities and challenges for relaunching minor destinations.

Originality of the paper. The research adopts a supply-side approach and analyzes the potential of digital nomadism for the development of minor destinations. The segment of digital nomads as a means to revitalize these destinations require stakeholders to offer services and products different from the traditional ones. The case could represent a training ground to study the changes in the development of the destination by considering its life cycle.

Key words: digital nomads; sustainable tourism; minor tourism destinations; repositioning; stakeholder theory

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1. Introduction

In the past years, new types of jobs, as well as ways to work emerged, with increasing flexibility in terms of time and place of work (Aroles *et al.*, 2020; Voll *et al.*, 2022), and thus, the opportunity to work remotely became more usual (Hermann & Paris, 2020; Wang *et al.*, 2018). This has been, of course, accelerated by the Covid-19 pandemic, where people were obliged to limit their contact to other people and thus, where possible, work from home (Almeida and Belezas, 2022). Of course, various information and communication technologies contributed to this shift (Merkel, 2022), like a good Internet connection and various applications that enable virtual communication (Hermann and Paris, 2020). With the loosening of restrictions, both workers and companies considered to maintain the possibility to work remotely and workers started to work from “anywhere” (Hermann and Paris, 2020; Wang *et al.*, 2018). This kind of way of life has been called digital nomadism (Hannonen, 2020; Makimoto and Manners, 1997; Mancinelli, 2020).

Digital nomadism represents an opportunity for the territories that are able to identify this trend and attract those workers, especially for those minor tourism destinations that are facing depopulation and undertourism (Ivona *et al.*, 2021). A recent report from the Associazione Italiana Nomadi Digitali (2022) highlighted the fact that digital nomads travelling to Italy are interested in small villages, in the hinterland and in those destinations surrounded by nature. Minor tourism destinations have the advantage to offer a quiet and small environment, distant to the chaos of the cities, as well as authentic and genuine experiences (Garcez *et al.*, 2022; Martini *et al.*, 2021). Through the theoretical background of stakeholder theory (Martini and Buffa, 2015; Freeman *et al.*, 2010), this study will contribute to the research about the opportunities of digital nomadism for minor and remote destinations (Garcez *et al.*, 2022), through qualitative in-depth interviews with key-stakeholders of the destination Valsugana in the Autonomous Province of Trento in Northern Italy, conducted between December 2022 and January 2023. Even though this is an explorative research with a focus on a case study, it contributes to the understanding of the perceptions of key-stakeholder about the opportunities and impacts of this new trend on the destination.

This paper will be structured as follow: the following chapter will provide a clearer definition of the phenomenon of digital nomads and its consequences for the destinations through a literature review. The context for this study and the methodology used will be then described, followed by an extensive summary and a discussion of the findings. Finally, conclusions will be drawn, including theoretical and managerial implications and limitations of the study.

2. Literature Review

2.1 Digital nomads

Although the phenomenon, as well as studies on digital nomadism are increasing, there is still no clear definition on the term (Hannonen, 2020). The term was used for the first time back in the late 90s, where Makimoto and Manners (1997) defined digital nomads as those professionals who can perform their work activities without being tied to one place specifically, and can thus work from anywhere in the world, through digital technologies (Hannonen, 2020; Wang *et al.*, 2018).

Workation is a new term that literally indicates the union of work and vacation (Voll *et al.*, 2022). There are various reasons, why digital nomads chose a workation, but mostly to escape the busy life in the city, as well as to combine urban and rural lifestyle and improve their health with more sport and leisure activities (Voll *et al.*, 2022). Warm and sunny weather is also thought to play a role in this (Garcez *et al.*, 2022).

According to the report of the “Osservatorio Innovazione Digitale nel Turismo” of the School of Management at Politecnico of Milan (Italy) (2023), 17% of Italians worked remotely from a holiday destination in 2022. Similarly, almost half of hotels declared that they hosted guests who were on workation. According to this report, the main need for a digital nomad is, of course, a high-speed

internet connection (see also Chevtaeva and Denizci-Guillet, 2021). Highly important are also the coworking spaces (Aroles *et al.*, 2020; Chevtaeva and Denizci-Guillet, 2021; Merkel, 2021), where digital nomads can perform their work in professional offices with many services connected (including relax and food and beverage areas). The cost of membership of the coworking spaces plays a critical role (Chevtaeva and Denizci-Guillet, 2021).

Moreover, the quality and cost of life are important, as well as a wide offer of cultural activities and after-work experiences (Martini *et al.*, 2021) that allow digital nomads to get a good balance between work and leisure (Garcez *et al.*, 2022). These activities include outdoor and sport experiences (Associazione Italiana Nomadi Digitali, 2022; Reichenberger, 2018), but can also have to do with food and culture (Chevtaeva and Denizci-Guillet, 2021). Finally, safety and a good healthcare system are a priority, especially following the Covid-19 pandemic (Martini *et al.*, 2019). Those experiences should ideally provide a sense of novelty for digital nomads, i.e. a lifestyle, culture and environment different than in their hometown. It is important to notice here that this need for novelty can lead to a continuous change of location (Garcez *et al.*, 2022).

However, even though digital nomads would like to participate in the local life and connect with the local population (Martini *et al.*, 2021), they rarely succeed. Some studies highlight that digital nomads find it hard to interact with the local population, thus the centrality of the coworking space as a place to work and create a community, not only between digital nomads themselves but also between locals and digital nomads (Chevtaeva and Denizci-Guillet, 2021; Merkel, 2021). In this sense, events at the coworking spaces that facilitate this exchange seem to be highly appreciated by the digital nomads (Merkel, 2021).

Chevtaeva and Denizci-Guillet (2021) identified niches of digital nomads: practical digital nomads, sociable digital nomads, and the explorer. Whereas the practical digital nomad looks for professional or hiring opportunities in the destination, and does not participate in social events, the sociable digital nomad wants to meet new people and takes part in parties and events. The explorer wants to participate in authentic experiences and is interested in culture, language and local food.

Other studies focus on the hospitality sector, defining the competitive potential of hotels that adapt to this new trend of demand through the creation of workstations and the establishment of a good Internet connection (Floričić and Pavia, 2021). Along the competitive potential to attract this niche, hotels have similar advantages to destinations: lengthening of the stay and the innovation of both physical and digital facilities, through a better Internet connection (Floričić and Pavia, 2021).

Previous research has considered the cases of Madeira (Portugal) (Almeida and Belezas, 2022), as well as Bermuda and Barbados (Hermann and Paris, 2020), that can be considered best practices in this sense. For instance, in Madeira, the project Digital Nomads Madeira was developed in 2021 with the aim of connecting digital nomads with local businesses and residents (Almeida and Belezas, 2022). One of the policies those countries developed is a special visa specifically thought for people who want to stay for a longer period of time and work from there (Merkel, 2021). Minor destinations, on the other hand, have the competitive advantage of being small, quiet in comparison to the big cities, as well as of an authentic and genuine cultural heritage and lifestyle (Garcez *et al.*, 2022; Martini *et al.*, 2021), and can thus be preferred by the explorer digital nomad Chevtaeva and Denizci-Guillet, 2021).

Italy is seen as a possible choice for digital nomads, who however have sometimes problems with Internet connection in rural areas (Associazione Italiana Nomadi Digitali, 2022; Martini *et al.*, 2021). Italy also lacks specific and packages of offers (Associazione Italiana Nomadi Digitali, 2022).

2.2. Opportunities for tourism destinations

The phenomenon represented, of course, an opportunity for different territories on different point-of-views. Overall, digital nomads can contribute to the local economy (Associazione Italiana Nomadi Digitali, 2022), through higher monetary income and new job opportunities (Garcez *et al.*, 2022). Moreover, through this new trend, tourism destinations can sustain tourism development

(Chevtaeva and Denizci-Guillet, 2021), revalorize their tourism products and services (Martini *et al.*, 2021), as well as renovate their offers (Osservatorio Innovazione digitale nel Turismo, 2022).

Previous studies highlighted how opportunities of digital nomadism for the destinations are in line with the principles of sustainability (Lee, 2013; Byrd, 2007; Bichler, 2019). One of the aims of sustainable community-based tourism is to improve the quality of life of residents on different aspects (Choi and Sirakaya, 2006). In line with this, the services developed for digital nomads are also useful and important for the local communities (Lee, 2013) that need to be involved in the development of such projects (Garcez *et al.*, 2022). These services include *in primis* a faster Internet connection, but also the creation of coworking spaces (Chevtaeva and Denizci-Guillet, 2021), a better infrastructure and mobility (Floričić and Pavia, 2021). Moreover, since remote workers are not bound to fixed and limited holiday periods, this trend is thought to contribute to the deseasonalization, with both longer and “off-season” stays (Choi and Sirakaya, 2006; Martini *et al.*, 2021), as well as to a long-term economic impact (Almeida and Belezas, 2022). Finally, it also represents an incentive for destination for the revalorization of underused resources and buildings, that can be useful also for the local population (Werther *et al.*, 2021).

The trend of digital nomadism is thought to be especially important for small, remote villages (Ivona *et al.*, 2021), as, on one hand, it encourages the development of slow tourism offers that preserve the authenticity of the destination (Martini *et al.*, 2021). On the other hand, digital nomads tend to prefer local and small businesses (Almeida and Belezas, 2022). Moreover, previous research on workation in rural areas analyzed the coworking spaces (Garcez *et al.*, 2022; Werther *et al.*, 2021), highlighting their contribution to the rural regeneration. In rural areas, many private and public spaces are empty or underused, so that the infrastructure for coworking spaces is already present and the initial investment is limited to the renovation and securing of the buildings (Werther *et al.*, 2021). In this sense, a new network of relationships is established, between the DMO and the public, when it owns those spaces, or with the private owners of coworking spaces (Bichler, 2019).

On the other hand, Almeida and Belezas (2022), though recognizing the fundamental role of local tourism businesses and other private stakeholders, highlight the importance of the local government as an accelerator and support for these kinds of projects, since it can provide the means and capacity that private stakeholders rarely have.

The risks of such projects include, according to the local communities, the danger of becoming popular and too overcrowded, thus distancing tourism development in the areas from the principles of sustainability (Almeida and Belezas, 2022).

As specifically regarding the Italian context, from the report conducted by the Associazione Italiana Nomadi Digitali (2022), digital nomads reveal some problems of the Italian context: the underdeveloped public and private mobility, lack of specific offers or packages, as well as places to find a complete bundle of information.

Even though we partially know that digital nomads want to escape the hustle and bustle of big cities (Voll *et al.*, 2022), few research has analyzed the opportunities and challenges of this trend for minor destinations (Garcez *et al.*, 2022; Martini *et al.*, 2021), especially regarding the perceptions of key-stakeholder about this opportunity for development.

Thus, this research will address this gap and will answer to the following research questions:

- what are the (structural, cultural, socio-economic) factors that contribute to the establishment of a destination for digital nomads?
- what is the stakeholders’ perception about the impact of digital nomadism for the local development of a minor destination?

3. Methodology

3.1 The case study

Valsugana is a valley and a tourism destination located in Northern Italy, in the South-eastern of

the Autonomous Province of Trento. In total, the destination includes 34 municipalities. Valsugana had approximately 161,000 arrivals and more than 500,000 overnight stays in 2019, mostly from Italy (63%), especially from the neighboring regions (ISPAT, 2020). Since the variety of the territory, the tourism offers are many, including relaxing holiday at the lakes, hikes in the mountains in summer and holidays in the snow in winter or cultural activities related to WWII. The peculiarities are, however, the thermal baths and the 400km of bike tracks.

Valsugana is the first tourism destination in Europe that in 2019 was certified as sustainable according to the criteria of GSTC (see <https://www.gstccouncil.org>). The Global Tourism Council (GSTC), founded by a network of organization, including UNTWO and UN Foundation, manages standards for sustainable tourism and defines the criteria related to four pillars, including socioeconomic and cultural impacts. This certification highlights the commitment of the destination and all its stakeholders towards sustainable tourism development, with a special focus on the centrality and involvement of the local population. Therefore, Valsugana can be defined a leader destination in this sense.

The DMO managing the tourism destination in Valsugana is called APT Valsugana Lagorai, founded in 2004 with the aim of improving the economy in the destination through the development of an innovative tourism and hospitality industry and supporting the stakeholders.

In Valsugana, a private project of creating a network of coworking spaces in the territory was developed through the recovery of old and underused buildings of the local bank, funded by the local bank and Trentino Impact Hub, the main coworking organization in the Province of Trento. The project is called “Alta Valsugana Smart Valley” and includes coworking spaces in four municipalities. Other two municipalities have developed public projects of study areas, with the objective of using them as coworking spaces as well, while other municipalities are planning similar projects.

Overall, there is a shared interest in becoming a destination for digital nomads. For instance the possibility to work and live in Valsugana has been promoted on the official website of the destination.

Thus, for the above-mentioned characteristics, the destination was considered adequate for the research objective.

3.2 Data collection and data analysis

This study follows the stakeholder theory, since Valsugana can be defined as a community-based destination and is thus characterized by a variety of public and private stakeholders that have an interest in and are affected by the tourism industry (Byrd, 2007; Freeman *et al.*, 2010; Martini and Buffa, 2015).

Being an explorative study and in line with the stakeholder theory (Freeman *et al.*, 2010; Martini and Buffa, 2015), the authors decided that a qualitative methodology was appropriate to answer the research questions (Jennings, 2005; Richards and Munsters, 2010). Semi-structured in-depth interviews are particularly suitable for an explorative study (Gillham, 2005). In fact, it allows to compare different opinions and perceptions, through a set of prepared questions developed from the literature; however, follow-up clarifying questions are allowed, when needed (Jennings, 2005).

For this research, 8 in-depth semi-structured interviews with key stakeholders of the destination were conducted, including the DMO, public actors and private managers of the coworking space. The interview guideline included three main blocks: the first part was dedicated to the description of the area and the actual presence of offers and services for digital nomads, then the opportunities and challenges of this trend, and, finally, the future steps for the destination. The interviewees had time at the beginning of the interview to present themselves, and at the end to add important topics that were not addressed in the interview.

Interviews took place online between December 2022 and January 2023 by one of the authors and lasted between twenty and sixty-five minutes, with an average of 33 minutes. With the consent of the interviewees, the interviews were recorded and transcribed. The transcriptions were then

coded using the iterative approach suggested by Mayring (2014), where themes and sub-themes were identified, combined and compared through an open discussion among the three authors.

All the interviews were conducted in Italian, only significant quotes were translated in English.

4. Results

First, it is important to highlight that most interviewees noticed a higher presence of digital nomads in some bigger towns, especially in the summer. These tourists were, however, staying in their private apartments and, thus, were not identified by the DMO and by the municipality. Thus, the tourism offer in this sense is not really structured. However, interviewees did not observe any negative experience or opinion in this sense.

4.1. Coworking spaces and Internet connection

As mentioned earlier, the coworking spaces are fundamental for a destination to become a leading destination for digital nomads. This was acknowledged by all interviewees as well.

The project Alta Valsugana Smart Valley is a project financed by the local bank in collaboration with Impact Hub Trentino for the restoration of old buildings and their transformation into coworking spaces with the aim of creating an opportunity for local development. Even though the project is primarily thought to improve the lives of local residents, two of these coworking spaces are frequented by many foreign or temporary users, especially in the summer.

There are other projects for coworking spaces from the public as well. These are initially thought as study areas for locals, but the stakeholders interviewed mentioned the possibility to use them as coworking spaces as well.

“We have just redeveloped an old industrial building, which is going to be a youth center, but the second and third floors are really big spaces, with tables, electrical sockets, connectivity, there’s fiber broadband and so it could be perfect for digital nomads” (I3)

Even though most interviewees mentioned the difficulties of a good Internet connection from remote areas, this problem has been addressed already. In fact, also thanks to European funds, high speed Internet connection are or will be soon installed in all the territories considered. All interviewees agree that Internet connection is the starting point to think about a project targeted to digital nomads.

4.2. Attractiveness of Valsugana

Interviewees mentioned the factors that contribute to the attractiveness of Valsugana for the target of digital nomads. Valsugana is a destination for visitors that are looking for a quiet and not overcrowded working destination, outside the hustle and bustle of the cities but with enough services to continue.

Even though there are still no tourism offers specifically thought for digital nomads, findings reveal that the tourism experiences already present in the destination, could be interesting for digital nomads. These are now targeted to outdoor lovers, especially mountain bike enthusiasts, as well as tourists looking for slow and authentic experiences, presenting the traditional lifestyle.

“We’d be interested in bringing people here, especially off-season, so that they could experience ‘slow living’, enjoying nature, but also enjoying life itself, immersed in their surroundings, meeting the local farmers, being able to watch cheese being made, milk being processed, really in contact with nature – the area offers these unique experiences.” (I3)

The authenticity of the experiences offered aligns with the principles of sustainability; this aspect will be explained more in-depth in the next paragraph.

4.3. Social sustainability

Findings confirm the centrality of sustainability for every tourism offer in the region, including those that aim at attracting digital nomads. Especially, the local community's needs are fundamental. In fact, services for digital nomads are also appropriate for the locals: for instance, the idea of the coworking spaces was initially for locals:

“To focus, from the point of view of territorial marketing, on this market, is, in my opinion, a good idea. In the end, if you provide services for digital nomads, there you are, you have them right there for everyone, so digital nomads and residents complement each other, they aren't in conflict”

(I1)

Secondly, the need for seasonal adjustment has been on the agenda of the destination for some time now. As one interviewee mentioned, the promotion of the destination now highlights the so-called “off-season”, including April and May, as well as October and November. Digital nomadism is thought to contribute to the seasonal adjustment, as people working from anywhere would want to travel anytime, independently from the season and can, of course, stay longer. Interestingly enough, however, most interviewees had the impression that the peak of digital nomads was still in the summer.

“We also hope to prolong the season, so that it's not just July and August, and that this'll mean we can have visitors in other months too, maybe in spring, in autumn. Get people to discover [the area] outside the two classic summer months too.” (I6)

“So, in May, June, and September, October – months that are still lovely, especially in the mountains, with the colors, to be able to make those weeks attractive, and to have visitors then too.

“To be able to promote them, as well, because we have these possibilities of digitalization and coworking – this is it, this will be the next step, we're one step behind, but we are getting things together, because we have a feeling that this could really be a great opportunity to bring the two elements together.” (I3)

Seasonal adjustment has been considered a priority also for areas that are living a stagnation phase, and thus were highly frequented destinations until the 80s and have now fewer arrivals and overnight stays. The consequences of this stagnations are evident especially in the number of empty second homes in the destination.

The target of digital nomads itself is in line with the principles of social sustainability, as they are considered to be more interested in the local traditions and history, as well as in an authentic contact with the local population. Similarly, a negative relationship between local population and digital nomads was not reported.

Moreover, interviewees consider the location of Valsugana interesting for digital nomads, as it is not far from the bigger cities of Trento, Rovereto and Bassano del Grappa, but it is a quiet not overcrowded destination in the mountains. Interviewees focused on the attractiveness of slow tourism and slow experience of mountain tourism, which allows local residents not to distort their lifestyle and habits:

“So the contribution that digital nomads can make in this sense is to valorize the unique things about the territory and bring people, families, groups here – people who want to experience life in the mountains in a certain way, which isn't, ok, I'm going to go skiing at a resort, but I'm going to go and unplug from the rest of the world and really go out and experience full immersion in nature.” (I3)

Another interesting topic in this sense, is that of the so called “local returnees”:

“people, originally from the Valsugana, who went and studied elsewhere and live and work in Italy, or abroad, who especially at Christmas and Easter, or in the summer, or for holidays, come back and rely on coworking hubs to allow them to stay here for longer.” (I5).

It is still a quite unstructured phenomenon, most people do not move back in Valsugana, so the contribute to the depopulation is still rather minor.

Interviewees also mention the growth of the local community through connections with professionals from all over the world and from other fields.

4.4. Governance and relationships

As regarding the governance of the destination, most interviewees mentioned the importance of an organization that coordinates and involves the different stakeholders and the different municipalities. Although some mentioned that this role could be conducted by the “Comunità di Valle”, most interviewees that the DMO is fundamental in this sense, especially in a project regarding destination management and tourism promotion. In this sense, it is important that the DMO Valsugana and the other stakeholder share the same values for a sustainable development in the destination.

The DMO has still not developed tourism offers or experiences specifically targeted to digital nomads, as packages, special after-work experiences or “temporal citizenship” activities. This has been related to the fact that the target is not central yet. Some interviewees were ready to think about and plan them, in case they would prove essential to attract digital this target. Another important public stakeholder is the local government as it provides the financial resources to realize these projects.

Another frequently mentioned topic was the relationship between public stakeholders and private stakeholder. This is particularly striking for the so-called “second homes”, that are empty most of the time; moreover, those buildings are often old and need to be renovated in order to become attractive. Second homes, however, are a proof that the destination is attractive for digital nomads, as there were a lot of people who moved to Valsugana and worked from their second homes there during the pandemic. One interviewee reports also increased overnight stays in the hotels.

“There’s definitely interest in this sort of activity, we saw it during COVID too, lots of people who maybe had a second house here, or a grandparent’s or uncle’s house, or parent’s, the idea of smart working has really got to them. I see lots of them asking if there are houses available, so that they can come and work remotely from here” (I4)

Another important private stakeholder is the local bank, owner of the main coworking spaces. Here, however, no conflicts with the public were reported.

Finally, one of the main future challenges for the destination in this sense is the need to create a network between different municipalities and different stakeholders. According to the manager of the coworking space, digital nomads often ask for an “all inclusive” package of offers or, at least, a place where they can find all the information they need.

4.5. Weaknesses and challenges

Part of the interviews also focused on actual and potential problems in the development of the destination Valsugana as a leader destination for this target.

One of the problems mentioned was the digitalization of marginal territories, especially those located in higher mountains, like part of Valsugana, and the offer of a high-speed Internet connection. Thanks to European funds and other projects, this has been already partially addressed or is on the top of the list for the other municipalities.

Findings also prove that the relationship between public and private stakeholders can be problematic, especially when regarding spaces or second homes. For instance, many houses or private buildings are empty most of the times, or they would need a substantial renovation, in order for them to be attractive and rentable. Relationship between public stakeholders can sometimes be difficult too, especially when they come from different municipalities or areas.

One interviewee mentioned the difficulty to find partners willing to invest in these projects at the moment.

Even though limited, findings provided interesting information also on the demand side, revealing that the digital nomads ask for more structured information or for packages that include their main needs, i.e. accommodation, coworking space, visa, after-work experience etc.

Finally, it is important for the destination to develop the right communication plan to attract this target.

5. Discussion

This paper analyzed the challenges and opportunities for minor tourism destinations of becoming a destination for digital nomads and the impact on the local community. Most themes that emerged from the analysis of the results are aligned with the literature.

Extreme importance to brand the destination as a leader destination for digital nomads has of course the internet connection, as extensively mentioned in the literature (Martini *et al.*, 2021; Chevtaeva and Denizci-Guillet, 2021). Even though fast Internet connection can be difficult to install for remote, mountain destinations, as mentioned by the interviewees, this has been already addressed by most municipalities already. Moreover, interviewees are aware of the centrality of coworking spaces for digital nomads, although the towns are on different levels on this point (Aroles *et al.*, 2020; Merkel, 2022). Where municipalities can act on their own, coworking spaces or common study areas are already present, or there are projects on that. In other cases, private stakeholders own coworking spaces or are working on the renovation of existing infrastructure with this aim (Werther *et al.*, 2021). In Valsugana, the pioneer in this sense was the local bank, with the project “Alta Valsugana Smart Valley”.

Valsugana already offers tourism experiences adequate to the expectations of digital nomads, especially those experiences presenting the authentic and traditional lifestyle in the Alpine pastures and in the mountains (Voll *et al.*, 2022), as well as outdoor sport activities, like mountain biking (Reichenberger, 2018). In this sense, following the characterization developed by Chevtaeva and Denizci-Guillet (2021), the target of Valsugana is the explorer digital nomad. Moreover, Valsugana is a quiet and rural destination, and is thus ideal for those that want to escape the city life (Voll *et al.*, 2020; Martini *et al.*, 2021). However, the destination does not offer packages of offers and services, which is seen as a lack for the digital nomads already visiting Valsugana. This is in line with the Report from the Associazione Italiana Nomadi Digitali, and strengthens once again the role that the DMO has for the development of a competitive offer for this target (Bichler, 2019).

As already explained in the paragraph where the choice of the case study was explained, sustainability is a central topic for Valsugana. This was confirmed by the themes and subthemes of the interviews, as topics regarding social sustainability were the most frequently mentioned by all interviewees. The target of digital nomads aligns with the objectives of sustainable tourism development (Choi and Sirakaya, 2006), and is therefore of particular interest for the destination. First, the stakeholders involved in the research mentioned the need for seasonal adjustment (Martini *et al.*, 2021). In this sense, digital nomads can contribute to this, as they are not bound to a holiday period to travel. However, the actual presence of digital nomads proves that the highest volume of visitors that combine work and vacation is still related to the high season.

Typical for a community-based tourism destination (Okazaki, 2008), interviewees report occasional challenges to meet the needs of all the actors involved, especially between private and public actors and among neighboring municipalities (Bichler, 2019). Thus, most interviewees mentioned the need to boost coordination and relationships among stakeholders and local community through the DMO (Garcez *et al.*, 2022; Bichler, 2019). Among the private stakeholders, the role of the coworking space was also recognized as a major actor (Merkel, 2021). Aligned with Almeida and Belezas (2022), many also highlight the fundamental role of the local government for the financial support.

Findings also reveal that not all the municipalities are on the same level on the development of this project (Bichler, 2019), some smaller territories with fewer resources are now starting to develop coworking spaces.

6. Conclusions

This paper presented and discussed the opportunities and challenges of digital nomadism for minor tourism destinations with a focus on the tourism destination Valsugana in the Autonomous

Province of Trento (Italy). This research contributes to previous research on digital nomadism as a tourism phenomenon, as it fills in a gap in the literature by considering a minor tourism destination.

With the present characteristics and offers, Valsugana has the potentialities of becoming a destination for the target of digital nomads, in terms of natural and cultural resources (Voll *et al.*, 2022; Reichenberger, 2018). To a limited extent, the digital infrastructure is already adequate for the needs of this target, in terms of Internet connection (Martini *et al.*, 2021) and coworking spaces (Merkel, 2021).

The opinions of the key-stakeholders involved in this research are positive, as they consider that the establishment of a destination for digital nomads has a positive effect on the destination on a social sustainable perspective: e.g. restoration of underused or empty spaces to establish coworking spaces that are useful for the local community as well (Werther *et al.*, 2021).

The managerial contributions of this study provide an overview about problems and opportunities regarding the target of digital nomads in minor destinations. First, high-speed Internet connection is fundamental (Chevtava and Denizci-Guillet, 2021; Martini *et al.*, 2021), even though it is taken for granted by both the community and the visitors. Moreover, destinations that are thinking to address this target need to consider that coworking spaces are the starting point to attract this target to the destination (Chevtava and Denizci-Guillet, 2021), but it is not enough. There is, however, the problem of the seasonality that destination managers need to address. Seasonal adjustment can be achieved through a proper communication and promotion of Valsugana as a destination for digital nomads.

The example of Valsugana could encourage other destinations that have similar characteristics and are facing similar problems to consider this target. In this sense, Valsugana could represent a training ground to study the changes in the development of the destination with a special focus on the life cycle of the destination. The target of the digital nomads could represent a trigger to re-launch a destination in its stagnation phase towards rejuvenation (Butler, 1980) through repositioning. Destination management has to face the typical managerial challenges related to community destinations, i.e. strengthen the involvement of private and public stakeholders. Considerations about the importance of local stakeholders and the local community to be active part of the destination development process (Bichler, 2019) are emphasized, in light of crucial aspects of digital nomadism. Digital nomads, in fact, are tourists that will become part of the local community.

Limitations of this paper include the focus on one single destination in the Autonomous Province of Trento, although Valsugana, as explained before, is highly representative of minor destinations in mountain regions that are facing both seasonality and stagnation and that have a strong interest in sustainable tourism development.

It is important that future research considers the opinion of other important private stakeholders in a community-based destination like Valsugana. Thus, future studies should expand the research with further interviews to the owners of the hotels, and other tourism SMEs. Moreover, future research should consider similar areas in mountain regions to extend and compare the results of this research. This is especially timing and of interest, especially in the low mountain areas that are becoming less attractive and operative because of higher winter temperature and less precipitation and that are looking for ways to reposition and rejuvenate the destination.

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A Concrete Action System in Shaping an Organizational Field for Root Tourism Exploitation. The Case Study of “Rete Destinazione Sud”

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Abstract

Framing of the research. *Roots Tourism is a rapidly growing socio-economic trend among travellers, tourists and immigrants searching a connection with their ancestral locus.*

Purpose of the paper. *The aim of this paper is to reconstruct the relational dynamics among actors playing a central role in the institutionalization of an organizational field to exploit the opportunities deriving from RT. According to this view, another objective of this paper is to highlight the developing new forms of collaboration between the economic actors and stakeholders, using a fitting case-study singled out the “Rete Destinazione Sud”*

Methodology. *The work presents a case study of a concrete project aiming at fostering the South Italy tourism destination, focused on a relationship model of value co-creation through multi-level agents’ engagement. The case is analysed through the lens of neo-institutional theoretical framework.*

Results. *From this study a strong interplay between institutional and local actors emerges, to develop a new way to network - in a bottom-up and top-down synergy.*

Research limitations. *Analyzing a Concrete Action System is not simple for any scholar, due to the opacity of what in concrete happens referring to the complex dynamics underneath.*

Managerial implications. *Roots tourism contributes to improve local and territorial development. Following the neo-institutionalist perspective, the work provides a contribution to the debates on the development of destination territorial strategies and its involvement in the organizational and multi-stakeholder configuration.*

Originality of the paper. *This paper analyses the Concrete Action System through the neo-institutional perspective declined in a new organizational and institutional model, identified in “Rete Destinazione Sud”.*

Key words: *Roots Tourism; Neo-Institutionalism; Concrete Action System (CAS); Organization Field (OF); Networking; Bottom-up and Top-down dynamics.*

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1. Introduction

The 2023-year marks the return of Italy to the forefront of international attention: with its rich history, vibrant culture, and unique place in the Mediterranean region, Italy plays a key role in the shaping of touristic and cultural future of Europe. In this perspective, 2023 is considered the *Year of the return to Italy* and this expression gives the name to a new touristic project in which are involved the most authoritative professionals among Municipalities, Regional and National Institutions, Universities, Tourism Entrepreneurs, Consortia, National Parks, Associations, Business Networks and foundations in Italian Regions. In particular, the project “2023 Anno del Turismo di Ritorno - Alla Scoperta delle Origini” is aimed at reaching Italians and over 70 million 2nd, 3rd and 4th generation compatriots living abroad. Focused on the strong linkage between youngest generations of Italian descendants living abroad and their motherland, especially on their affection to the country-of-origin traditional practises, this project is inspired by the emigrational flows, which started from the past decades and led to an important development of the Tourism of Return, often termed Roots Tourism (RT).

The realization of this ambitious project requires the involvement of different actors, coming from the socio-economic world to the political and institutional one, together engaged in ‘creating a system’ around the definition of a new form of tourism. At the same time, it should be noted that the current Italian scenario is characterized by adverse socio-economic conditions, small size, marginalization, and fragmentation of agents in the Italian system, as well as its low levels of competitiveness; all these traits represent central issues on the political agenda of recent years. These conditions appear even more evident in the tourism dynamics in which heterogenous actors coexist. Indeed, tourism is a large and articulated industry, whose boundaries are not always well defined. After all, the same tourist product can only be understood as the result of a complex system, made up of many different, strongly independent components, in which the interacting actors can come from both the private and public sectors.

In this complex context, scholars’ and decision-makers’ attention has increasingly focused on the design and implementation of processes that would allow actors to be involved in any stage of the economic activities production. In particular, in this scenario, what has progressively emerged is that aggregation processes (between individuals, groups, and social and economic organizations) may be strategic in overcoming the low competitiveness and low dynamism of the Italian socioeconomic system; it is evident, for example, that in the tourism sector the great fragmentation of its economic actors represents a strong limit on achieving desired aggregation levels (see, among others, Selin, 1994; Jamal and Getz, 1995; Hall, 1999; Scott *et al.*, 2008; Beritelli, 2011).

Starting from this premise, the management science debate has been enriched by contributions regarding aggregations among socio-economic operators, focusing the attention on the mechanisms aiming at regulating relations that would orient strategic conduct in a complex, strongly competitive, global and modern environment (see, among others, Boari *et al.*, 1989; Thompson, 1990; Ring and Van De Ven, 1992; Gulati, 1995; Hakansson and Snehota, 1995; Rispoli and Tamma, 1995; Arcari, 1996; Cotesta, 1998; Lorenzoni and Lipparini, 1999; Pendenza, 2001; Brondoni, 2004; Rullani, 2004; Soda *et al.*, 2004; Yin *et al.*, 2012).

The aggregations can be based on spontaneous mechanisms of coordination, rather than on regulatory and contractual ones. The aim of these aggregations is to build relationships of a collaborative, stable, and lasting nature, that can achieve relational performance. This performance is justified by the motivational growth of cooperation, inspired by solidarity, mutual adaptability, and the desire to reduce opportunistic behavior risks (Das and Teng, 2001; Mancini, 2010; Gulati *et al.*, 2012; Geretto and Zanin, 2017).

The purpose of this work is to reconstruct the relational dynamics among actors playing a central role in the institutionalization of an organizational field, in order to exploit the opportunities deriving from RT. To reach this scope, we adopt the neo-institutionalist approach allowing us to broaden the focus from the analysis of the relationship dynamics within the sector to a wider relational context involving a plethora of different actors with a very diverse profile. In this

perspective, the Concrete Action System (CAS) assumes centrality as a multi-level actors' perspective, a structure of organized human interactions, a logical and sociocultural space of exchange of shared value creation' in which various actors are involved in negotiation and cooperation processes attempting to construct the observed social reality (DiMaggio and Powell, 1983; Scott, 1995; 2002; Wooten and Hoffman, 2008; Greenwood *et al.*, 2017). In pursuing their own interests, social agents draw a network of mutual influences, and in practice, they contribute to define (if not always intentionally) a type of rationality, whereas certain behaviors are imitated and diffused, while others are abandoned over time.

In this scenario, the CAS can support the developing of RT, and through the neo-institutionalism framework, the importance of social norms and institutions in fostering the underlying dynamics can be understood. Neo-institutionalism is a theoretical perspective approach emphasizing the role of social agents, organizations, and institutions in shaping economic and social behaviours. A set of shared expectations and rules, laws and regulations, cultural values and customs represent routed constructs of this viewpoint.

The CAS could so be read as an engine capable to setup cooperation and collaboration between governmental and non-governmental actors, towards the institutionalization of an Organizational Field (OF), whose scope is to catch the opportunities and mitigate the risks linked to the tourism development.

The institutionalization of a OF to stimulate the RT is based on the activation of relationship dynamics, consistent with regulatory framework and territorial policies of the communities and associations participating to a new challenging CAS.

To address this aim, the paper is structured as follows: the first section briefly presents the Root Tourism phenomenon in literature. Then, a theoretical framework aimed at identifying the Concrete Actions System (CAS) is presented and applied to identify a double-level of negotiation (bottom-up and top-down relational dynamics) involving the actors in the institutionalization process. Thus, *Rete Destinazione Sud* is presented, an emblematic case of CAS aiming at building a strategic network able to play a key role in the institutionalization of an Organizational Field engaged to capture the opportunities coming from the Root Tourism. Finally, the discussion and conclusions of the study are considered.

2. A brief reconstruction of the literature on Roots Tourism (RT)

Roots Tourism (RT), often mentioned as *Tourism of the Roots*, is a segment of the tourism market that focuses on visiting places that are significant to historical personal heritage or cultural identity. This phenomenon appears in the literature under many different terms because it encompasses various aspects of travel related to cultural heritage and personal ancestry. This variegated set of terms reflects the complex and multi-faceted nature of the socio-economic phenomenon. Each term emphasizes different aspects of the experience and appeals to different motivations, interests, and expectations of travellers (Poria *et al.*, 2003; Coles *et al.*, 2005; Butler, 2015; Wagner, 2015; Basu, 2017; De Santana Pinho, 2018).

In literature, RT concept is linked to other locutions:

- "Nostalgia tourism", which refers to the emotional need to come back to family, visiting parents and childhood friends, in order to spend some quality-time (Maslow, 1954);
- "Legacy tourism" stands for "ancestral tourism" or "genealogy tourism" and has the same meaning (Gaudry, L.R., 2007);
- "Ethnic tourism" concerned to a travel to exotic cultural locations, such as places of the habitat of indigenous tribes or people or adventures in general, not related to one's roots sentimental tourism (Tomczewska-Popowycz, 2022, Kouchi *et al.*, 2018; Wong, *et al.*, 2020).

All these locutions are detectable to the RT notion that embraces a touristic phenomenon "generated by migrants who leave their country of origin and travel for vacation, often being away for a long time, or by their descendants who desire to visit and discover their family's land of origin.

The trip and the stay are one's birthplace is a highly emotional experience: for the first generation, it becomes a way to research one's roots and to discover the places where one's ancestors lived, especially for those who have partially or completely lost their connection to their homeland (De Marchi and Mingotto, 2016; Ferrari and Nicotera, 2021).

This type of tourism is very significant in all the Countries around the world that have experienced very important emigrational phenomena throughout their history. Due to the strong expansion of the phenomenon, which not only involves Italy, but many other Countries across the globe, different terms are used throughout the literature to describe this touristic phenomenon and the various aspects characterising it (Sorrentino *et al.*, 2022; Tomczewska-Popowycz *et al.*, 2022).

Above all, RT is closely related to migratory flows phenomenon, that has affected part of economic hardship Countries, in which people left their country of origin to seek their fortune abroad in a foreign country. This could include visiting the hometown of ancestors, places associated with a particular ethnic or cultural group, or historical sites that are important to personal or cultural history. The goals of RT are related to the chance to connect people with their past, learn more about heritage, and gain a deeper understanding of their own cultural identity. Indeed, during their holidays, roots tourists desire visiting their motherland to understand their ancestor's heritage, experiencing the lifestyles of their countries of origin.

In the state of art, RT has been linked to many benefits, including (Durie *et al.*, 2006; Canestrino *et al.*, 2015; McKercher, 2016; Marschall, 2017; Backer, 2019; Cannas, 2022):

1. cultural heritage promotion and preservation: visiting places that are significant to heritage can help raise awareness and appreciation of cultural heritage, which can lead to its preservation;
2. enhancing personal and cultural identity: by visiting places that are important to one's heritage, individuals can gain a deeper understanding of their personal and cultural identity, which, in turn, can have a positive impact on their self-esteem and sense of belonging;
3. reconnecting with family: it provides an opportunity for people to reconnect with their family members and learn about their ancestral history, or travelling for family events such as weddings, family reunions, funerals, or meetings;
4. promoting intercultural understanding: RT can promote understanding and appreciation of different cultures, which can help to foster greater tolerance and respect for diversity;
5. improving individual well-being and quality of life, such as medical and business tourism, whereas it is more convenient for immigrants to come back to their motherland to receive cheaper medical treatments or more advantageous job offers.

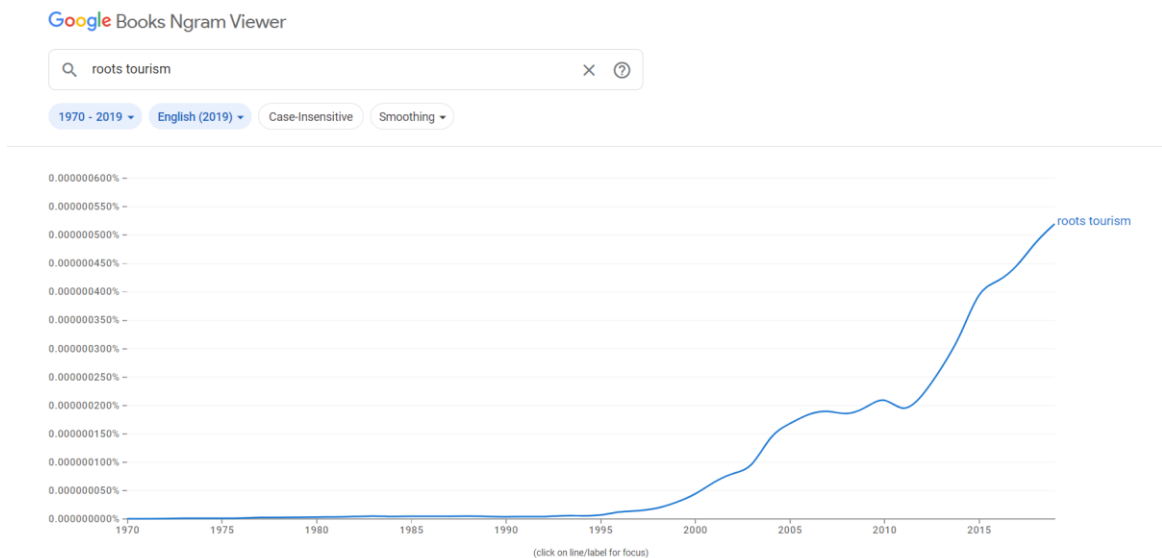
Based on the arguments outlined above, RT gives both personal and socio-economic benefits, playing a role in promoting cultural heritage, in fostering a sense of belonging and in developing new touristic projects.

During our research process, to provide a strong but necessary structural composition of our literature review, we started from *Google Ngram Viewer*¹. This technique allows us to make the trends in the data clearer and easier to interpret, showing the frequency of how many times "Roots Tourism" terms appeared throughout the literature studies.

In this graph (Figure 1. "Roots Tourism" Google Ngram Viewer) we can look at spikes and valleys of these terms and where they became popular, taken account by scholars. Moreover, the scholars' growing interest on this subject from 1995 up to 2019 is not unsurprising.

¹ This is a tool that charts the frequencies of a word or a phrase of some sets of search strings. In this case, it charted the frequency of the words Roots Tourism using a yearly count of n-grams and it found some results in a published corpus of books over a specified period of time, between 1970 and 2019. In this context, we used the "smoothing" algorithm (equal to 3) that refers to a statistical technique needed to smooth out variations in the data and reduce noise in the results.

Fig. 1: “Roots Tourism” Google Ngram Viewer



Source: our elaboration.

This form of tourism is raising awareness among businesses, policy makers and public authorities on its touristic potentials, in terms of market attractiveness. RT has such a lot peculiarities, but the most important consists in being a tourism development tool for potential destinations affected by population loss.

3. The Theoretical Framework: Neo-Institutionalism and the Concrete Action System (CAS) in Shaping an Organizational Field

3.1 The basis of the Neo-Institutional Perspective

Neo-institutionalism is a theoretical perspective based on the role of institutions and their shaping function on human behaviour and social outcomes, in which socio-economical actors tend to conform to institutional prescriptions and postulates. This approach is related on processes of construction, destruction and reconstruction of social reality, as well as on the pressures they exert on individuals and organizations (Meyer and Rowan, 1977, 2000; DiMaggio and Powell, 2000; Zucker, 2000; Bonazzi, 2002; Sparti, 2002).

The focal point of this approach is based on human actions and the role played by socio-economical actors and stakeholders, acting bound by an institutional framework, created over the time, and made up on a set of rules, procedures, and decisions (Carolillo *et al.*, 2011).

That is the keystone to understand the Neo-institutionalist theory, conceived as an approach to figure out the way in which institutional actions impact on the behaviour of individuals and groups, though the binding and enabling effects of formal and informal rules. It can be stated that the neo-institutionalist approach in organizational studies could help to understand the institutional environment, as a set of rules, customs, institutions, and organizations, especially focusing attention on the complex dynamics of interactions between the various actors operating in ‘concrete’ fields of action.

The field of action, therefore, emerges from the individual and collective actors, becoming the essential result of a sedimentation of cognitive elements that find legitimacy in being adopted widely over time by the same actors who deviate from it, rather than in technical rationality (Costa, 1996). The actor, both individual and/or collective, thus becomes the architect, albeit not entirely intentionally, of the environment itself in structuring the social reality to which he/she belongs. The neo-institutionalist approach therefore recognizes the concreteness and inescapability of the field of action, within which the relational plot between the actors takes shape.

In a scenario in which these different actors are simultaneously *agents and acted out*, the unit of analysis that acquires priority refers to the concept of Organizational Field (OF), described by Powell and DiMaggio as “*recognized area of institutional life*” (Powell and DiMaggio, 1991), as a cross-result of the actions of a “*constellation of actors that comprise central organizing unit*” in a given context (Scott, 1995). With Scott’ analysis, the concept of OF refers to “*a community of organizations that partakes a common meaning system and whose participants interact more frequently and fatefully with one another than with the actors outside the field*” (Scott, 1995).

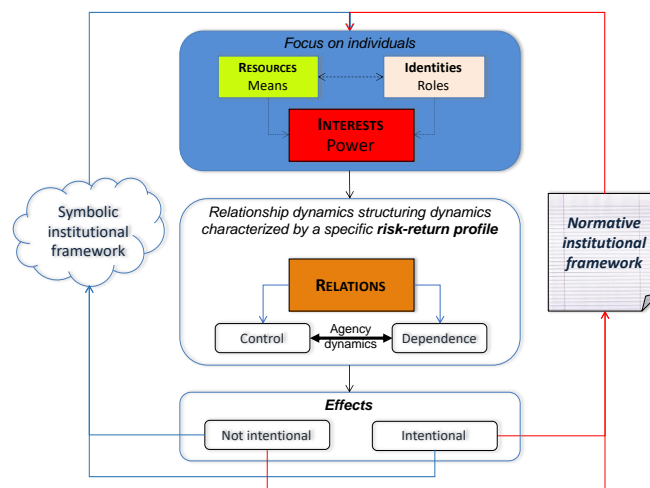
In order to better understand the scope and the centrality of this concept, we need to be aware that any OF appears as a immanent and *significant group* ‘concretely capable of acting’ aiming at creating and giving meaning to an intersubjective concept of the environment. In other words, an OF is a network which acquires cognitive capacities once structured, such as the fact of being able to influence the social, political, cultural, and economic systems with which it interacts.

The relationships between the actors in the field allow the production of a set of shared meanings among all the interacting actors in it, based on the common perception of organizations of belonging to the same field. In an OF, all the actors involved are, at the same time, object and subject of the pressures that cross the field itself (Bonazzi, 2002). An OF assumes the dimension of ‘contextualized space’, that is a “relational space that provide an organization with the opportunity to involve itself with other actors” (Wooten, Hoffman, 2008) to intercept more resources than those they would get standing alone.

3.2 The Concrete Action System (CAS)

In order to exploit the opportunities deriving from the RT, the creation of an OF becomes crucial, by a Concrete Action System (CAS), capable of pooling the efforts and resources available to a series of key players, so-called Institutional Entrepreneurs (Buhalis and Westlake, 1993; Laws, 2004; Ateljevic *et al.*, 2007; Lew *et al.*, 2008; Gretzel, 2011; Fyall, 2012; McCabe, 2014). A CAS refers to a set of interactions between multiple agents acting for a common scope, accepting a such criterion of rationality, as basis of any institutional framework (Crozier and Friedberg, 1978). In other words, the CAS refers to the ability of individual or collective actors to structure interactions according to his/their own interests, to exploit the constraints and opportunities of the context to establish, to maintain and expand the relative margins of manoeuvre and of uncertainty. This intention can lead the actor to activate aggregation processes, emerging from the interaction of social actors as a result of a set of games, conflicts, negotiations, values and rules, being at the same time the tool of the strategic game that the actors involved implement (Nigro and Iannuzzi, 2017). Figure 2 represents a simplified scheme of a Concrete Action System.

Fig. 2: A Concrete Action System Scheme

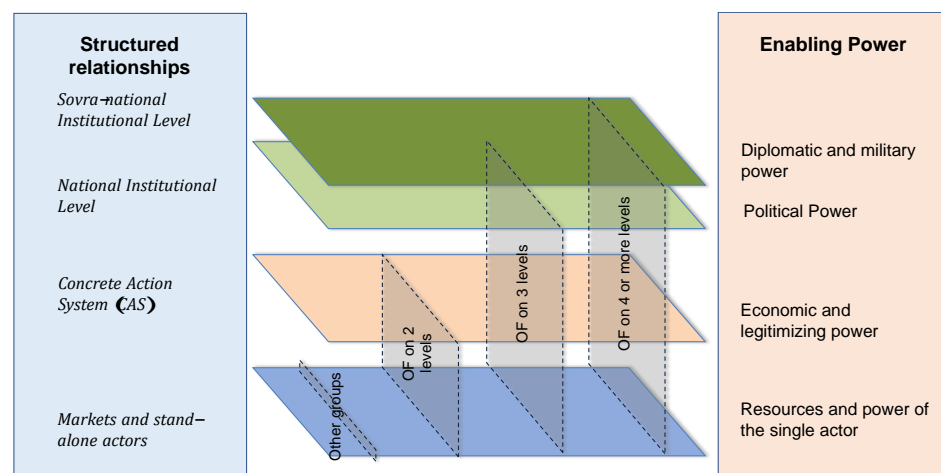


Source: Nigro, Iannuzzi, 2017.

The CAS model consists of three main components: actors, structures, and processes. Actors refer to the individuals or groups involved in a particular social context, and they are seen as rational agents who make choices based on their goals and available resources. Structures are the formal and informal institutions that shape their behaviour, both symbolic and normative, providing the actors with freedoms of action and constraints within which their choices are made. Processes are the interactions that occur between actors and structures over time, relied on agency dynamics of control/dependence, including negotiation, conflict, cooperation, and competition.

Overall, the CAS model provides a powerful tool for analysing complex social phenomena and understanding how different actors and institutions shape one another’s behaviour. By breaking down social systems into their component parts, researchers can gain a deeper understanding of the factors that drive stand-alone actors to get networked.

Fig. 3: A Concrete Action System Scheme



Source: our own elaboration.

3.3 The Institutionalization of a Concrete Action System

Understanding the processes and mechanisms of structuring a CAS is a central theme in this work. At this point, it is appropriate to take into account a procedural perspective, focusing on the analysis of two fundamental elements:

1. the nature and role of some key players, called *Institutional Entrepreneurs*;
2. the activities carried out by actors to define a certain institutional framework, constituting the *Institutional Work*.

Firstly, given the difficulties in building up a CAS in the face of competition and to get the underlined opportunities in tourism industry, it is necessary to define and to analyze the Institutional Entrepreneurs and their Institutional Work.

The Institutional Entrepreneurs are individuals or organizations that play a key role in initiating and driving change within an institutional context. They work to create new institutional arrangements or modify existing ones to advance their goals and bring about societal transformation. They often challenge the *status quo*, and their actions can lead to changes in formal and informal rules, norms, and practices that define an institutional field. What emerges, in particular, is how a CAS may occur from the every-day activities of some practitioners struggling to accomplish their work, how it becomes sensemaking at the level of the context which the same agents work, and how it operates to the industry in which their organization exists.

Indeed, an Institutional Entrepreneurship (IE) is associated with the process of institutional change, as agent in charge of a specific role to create new arrangements or to alter existing ones to achieve their objectives. This can include the creation of new organizations, the development of new norms, or the revision of existing policies, as long as the actor has got sufficient resources. For

this reason, they are capable to see an opportunity to realize interests having a high value in the process aimed at the creation of a new system of meaning, to be related to the functioning of a set of different institutions (DiMaggio, 1988).

Recovering Coase' theory, an institutional entrepreneurship is "*the activity of initiating, creating and leading organizations that specialize in developing institutional frameworks that lower transaction costs*" for other actors in the field (Coase, 1992). These actors usher in the Institutional Work (IW), and then, make use of a very large range of additional actors, whose role is to support and/or facilitate the efforts made by the former (Clemens, Cook, 1999). The IW is promoted by IE and it is structured by advocacy, public affairs, and lobbying strategies. They move 'in institutional corridors' to favor a relative income position for the plethora of other agent interested into the activities promoted by the CAS, or to legitimate the representation of their interests.

From these notes, it emerges how the neo-institutionalist theory, through the recognition of the concept of IW, deems it necessary to focus its attention on the process of construction, maintenance, breaking and reconstruction of a framework that can define itself "institutional, temporarily bound and binding".

Alongside the process of aggregation carried out by the IE (a bottom-up process), it is important to underline their attempt to be involved by institutional players in the social and political debate, furnishing a clear example of the so-called participatory deliberation (a top-down process).

This motivation springs from the belief that those affected by political decisions must play an active role in the construction of the regulatory framework. In fact, involvement in the political decision-making process would reduce the risk of failures in such initiatives (Felt and Wynne, 2007).

The legitimacy of decisions comes from the existence of open debate (Felt and Wynne, 2007, 55), inclusion which makes the decision-making process 'democratic' and increases mutual trust, replacing a cynical spirit with a civic one (Regonini, 2005). Beyond these specific effects, participatory processes allow a broadening of the scope of decisions, making the alternatives and methods more transparent. Deliberative participation creates a Concrete Action System mixed with public spaces in areas where more limited and opaque exchange mechanisms would otherwise prevail. Nonetheless, there is a paradox in participatory practices, consisting of the fact that they appeal indiscriminately to all citizens, but in practice often manage to involve only a very small minority.

However, a short-sighted reading should not be adopted; instead, we should seek in democratic involvement the best way to obtain *a priori* effective decisions, without knowing the effectiveness of the actors. We wonder whether the choice to become involved does not in fact represent the first result of a negotiating game based on the enabling power of institutional actors.

The integration between these three components, together with Neo-institutionalist theory, is likely to explain how different stakeholders create a relational structure to develop "roots tourism" and a connected touristic destination brand.

In light of the above, the relationship between Neo-institutionalism and "Roots Tourism" is explained by the cultural, economic, and political institutions of a country, since they could shape the perception of the country as a destination for "Roots Tourism" and the availability of resources and infrastructure to support it. Institutional norms and practices can also impact the types of experiences and interactions that tourists have while visiting their ancestral homeland. Institutional norms and practices are likely impact the types of tourists' experiences and interactions while visiting their ancestral homeland.

So, "Roots Tourism" could contribute to the institutionalization of cultural heritage and the promotion of cultural norms and practices. In conclusion, "Roots Tourism" becomes more popular and influential, it is likely to create a demand for cultural preservation and representation, and to lead to the creation of new institutions, policies, and practices, aimed at promoting and supporting cultural and touristic heritage.

3.4 The Roots Tourism read by the neo-institutionalist perspective

The neo-institutionalist perspective provides to the RT context a set of contributions:

- explanation of institutional influences: Neo-institutional theory helps to explain how institutional norms and practices shape the development and growth of "Roots Tourism", as well as the experiences and interactions of tourists visiting their ancestral homeland;
- understanding of power dynamics: Neo-institutional theory highlights the role of power and politics in shaping institutional norms and practices. This perspective can help to shed light on the power dynamics involved in the development and growth of "Roots Tourism", including the influence of local and national institutions, governments, and other stakeholders;
- analysis of institutional change: Neo-institutional theory provides a framework for analysing how institutions change over time in response to external pressures and internal processes. This perspective is likely to help the understanding of how "Roots Tourism" and cultural heritage institutions are evolving and adapting to change cultural, economic, and political contexts;
- emphasis on organizational culture: Neo-institutional theory places a strong emphasis on the role of organizational culture and practices in shaping institutional norms. This perspective can help to understand how the culture and practices of "Roots Tourism" organizations, such as tour operators, heritage sites, and local communities, contribute to the development and growth of "Roots Tourism";
- synergic collaboration between different actors: in this kind of organization, there are some protagonists that are involved into developing process of touristic network (City/town Hall, Pro-loco, Regions, Associations...);
- confined touristic Organizational Field: Organizational Field is a concept developed by Walter Powell and Paul DiMaggio. It refers to the set of organizations and institutionalized norms, values, and practices that define a particular organizational domain. The concept highlights the importance of the external environment in shaping organizational behaviour and decision-making. In other words, organizations are not isolated entities, but they are shaped by the context in which they exist and interact with other organizations. In this particular case, "Rete Destinazione Sud" is an inter-connected Organizational Field composed on: Rete di Imprese (Business network), Rete di Destinazioni (Destination Network), Reti di Portali (Web Portal Network), Statup innovative (Innovative Startup), Rete di Commercializzazione (Marketing Network) and Rete di Relazioni (Network of Relations);
- focus on legitimacy: Neo-institutional theory highlights the importance of legitimacy in shaping institutional norms and practices. This perspective can help to understand how "Roots Tourism" is perceived and evaluated by different stakeholders and how the legitimacy of "Roots Tourism" practices and institutions impacts their development and growth (Carolillo *et al.*, 2011; Meyer and Rowan 1977; Powell and Di Maggio 1991).

When we talk about Organizational Field (OF) in tourism context, we refer, in general, to the set of organizations and institutionalized norms, values, and practices that define the tourism industry as a whole. It encompasses all the various organizations, institutions, and actors involved in the development, promotion, and delivery of tourism services, as well as the norms and practices that shape the behaviour of these organizations and actors. It provides a framework for analysing the competitive dynamics of the tourism industry and the role of power and politics in shaping the development of the field.

In the tourism context, overall, in "Roots Tourism", the Organizational Field includes a wide range of organizations, such as hotels, tour operators, attractions, and transportation companies, as well as government agencies, industry associations, and other institutions involved in promoting and regulating tourism (entrepreneurs, associations, foundations, community initiatives). These organizations are connected through a system of relationships, such as contracts, regulations, and shared norms and practices, that shape the behaviour of individual organizations and the development of the field as a whole.

The Organizational Field in tourism also interacts with a broader set of institutions, such as the global economy, cultural norms, and political systems, that shape the development of the tourism industry. The interplay between these various actors and institutions creates a complex and dynamic environment that shapes the growth, development, and competitiveness of the tourism industry.

The acknowledged importance of “Roots Tourism” leads the municipalities giving life to some cultural initiatives to create events dedicated to the migrants who return to motherland for vacations, holidays or patronal festivals.

The “Roots Tourism” is considered an important tourist segment, also in potential terms, by administrators, especially in small centres; in fact, the administrators consider that their cities are attractive tourist destinations for Roots Tourists.

The main reasons for the trip, especially in Italy, are: meeting relatives and friends, researching the origin’s families and so on.

According to the Neo-institutionalist perspective, also the Pro-Loco, as well as other voluntary local associations, are involved into the organization of tourism and cultural events, fairs, concerts, shows, coordinating and sharing a summer calendar with tourist operators and other associations in the territory.

“Roots Tourism” is an international phenomenon, and it can be demonstrated by the institutional involvement. In fact, the Ministry of Foreign Affairs and International Cooperation (MAECI - Ministero degli Affari Esteri e della Cooperazione Internazionale) is working for the development of “Roots Tourism” in Italy.

Also, ENIT (Ente Nazionale Italiano per il Turismo) is involved into the Roots Tourism interest in Italy, studying the flow connection to Roots Tourism and other promotional activities.

There is also a Confederation of Italians around the World (Confederazione degli Italiani nel Mondo), an organization showing a strong interest in Italian descendants, emigrants with some proposals on the topic of “Roots Tourism” (Ferrari and Nicotera, 2021).

As previously stated, the concept of Organizational Field is useful to understanding the drivers of change and innovation in the tourism industry, as well as for exploring the relationships between organizations and the broader institutional context.

In line with the theoretical framework and the model in Figure 2, the institutionalization of the network of the “Roots Tourism” sector passes through the work of individual and collective actors, in which in various capacities they have contributed both to the configuration of the OF and the current institutional, regulatory and symbolic framework. This approach highlights the role played by social actors in this process, due to the relative negotiating power that enables the action, i.e., the aggregations and associations between economic operators and consumers in the “Roots Tourism” sector and the relative negotiating weight that manage to exercise carving out in their own decision-making processes.

In our opinion, the analysis of the OF requires a double focus to classify the actors and the actions they undertake: 1) the domain of politics in terms of multifunctionality; 2) the convergence of the interests of the “Roots Tourism” actors to create synergies that enhance local resources.

The guidelines refer to a double level of negotiation involving the actors, protagonists, and minors of the institutionalization process:

- the first level emerges among actors - be they local, national or supranational - sometimes in competition with each other, contributing to the reconfiguration of the domain of policies;
- the second level contributes to affirm the alternative sectoral circuits due to the collective actors (for example, due to the activation of alternative circuits for local action promoted by associations and movements expressing the interests of the actors in “roots tourism”).

4. Case Study - Rete Destinazione Sud²: a Challenging Way to Networking

“Today we can no longer compete alone in a globalized world and, above all, we can no longer compete with traditional tools and with often significant structural and infrastructural gaps. Some diseconomies and some gaps can be bridge with a network system capable to developing synergies and generating economies and value”.

Michelangelo Lurgi - President of “Rete Destinazione Sud”.

“Rete Destinazione Sud” (RDS) is an innovative start-up project based on the creation of touristic destinations with the cooperation among companies, institutions, associations, consortia and different types of stakeholders from the territories of Southern Italy.

It was founded in 2014 by a group of Southern Italian tourism entrepreneurs from Basilicata, Calabria, Campania and Puglia with the purpose of creating a regional-network, in which different socio-economic stakeholders, as well as different typologies of institutional and no-institutional actors could enhance territorial resources and cultural heritage.

The focal point of this valuable case study is made up of the idea to create an Expo of “Italianness” (Brochure - 2023 Anno del Turismo di Ritorno).

Thanks to the collaboration and the authorizations of the Italian Ministry of Culture and the Ministry of Foreign Affairs, “Rete Destinazione Sud” has the potential to become a wide-ranging project, thanks to the promotion of events and activities, taken up by RDS website and listed below:

- presentation in the major tourism and agri-food trade fairs in the world, in collaboration with business networks, consortia, associations that have already joined the initiative and with ENIT (National Italian Tourism Bureau);
- initiatives involving the Italian chambers of commerce abroad;
- presentations to Italian associations and foundations in the world;
- presentations in all the Italian regions and municipalities, already joining the project;
- promotion of networks of companies that work with foreign countries already adhering to the initiative;
- fostering the television and radio networks abroad that have already expressed their willingness to support and promote the initiative;
- constituting networks of honorary consuls in Italy;
- collaboration with the Italian consulates and embassies abroad in partnership with the Ministry of Foreign Affairs and the Farnesina;
- developing networks with Italian universities.

This project consists in a complex combination and synergies among different kind of networks: Rete di Imprese (Business network), Rete di Destinazioni (Destination Network), Reti di Portali (Web Portal Network), Start-up innovative (Innovative Start-up), Rete di Commercializzazione (Marketing Network) and Rete di Relazioni (Network of Relations).

Due to this synergic collaboration, RDS created a brand, “*Sud Italia*”, known also internationally, by planning web sites and web portals in order to share information about activities, social and cultural events for compatriots who live abroad, interested and willing to be up-to-dated on the latest events or in better knowing places where their ancestors departed from.

The managerial organizational structure of the project initiative is composed in the following way:

- 3 teams activated and setting up the project, the activities program and the coordination of the National Committee;
- a national coordination committee;
- a regional coordination committee;

² <https://www.retedestinationsud.it/>

- a scientific-technical committee;
- a participatory foundation, responsible in promoting and following the development of the project.

RDS developed a model capable to involve companies, entrepreneurs, local administrators, public and private operators in the construction of a system able to transform a destination into a touristic product, that can be replicated on national and international markets, also in all the realities of Southern Italy (Figure 4):

Fig. 4: “Rete Destinazione Sud” structured model



Source: <https://www.retedestinazioneud.it/la-rete/>

Among the various initiatives, the network promotes RT, soliciting the interest of all the network' players and, at the same time, of third parties.

In particular, the network is engaged in the creation of a shared strategic project for the animation and promotion of social, economic, cultural and tourist development based on the definition of a “Model of destination”.

Indeed, in the two-year period 2012-2013 a series of meetings among entrepreneurs from Southern Italy has been held, with the aim of verifying the conditions for the creation of a single development project for the South, and in November 2013 a two-day event on tourism, called “Destination South - Analysis and planning for tourism” was conceived and organized.

Driven by the results obtained with this last event, a discussion was opened among the participants and those who had taken part in the initiative of October 2012: “Let’s put the Territory on the Net”. The result is a multi-regional aggregation project that sets a program and objectives to stimulate the confrontation with all the entrepreneurs of Southern Italy.

The evaluations emerged from this experience, made up of over 40 presentation meetings, organized by Sir. Michelangelo Lurgi throughout Southern Italy (Salerno, Cosenza, Bari, Taranto, Cagliari, Olbia, Potenza, Matera, Grottaglie, etc.), led to the birth of the RDS in May 2014, with a

notarial act at the headquarters of Confindustria in Salerno. The Network was officially presented at the national press conference in July 2014 at the headquarters of Confindustria in Rome.

Coherently with the theoretical framework, in which the interaction among the individual and collective actors contributes to the structuring of a Concrete Action System characterized by the convergence of a specific interest, RDS emerges from the activation of relations among actors who already are part of it, and who have the purpose of grab the opportunities coming from RT.

Indeed, all actions starting from 2014 and persisting in the following years (memorandum of understanding, agreements and conventions with institutions, GAL etc.) are the premise for the configuration of a CAS, as previously reported.

As said, the CAS refers to the ability of individual or collective actors to structure interactions according to his/their own interests, to exploit the constraints and opportunities of the context, to establish, maintain and expand the relative margins of manoeuvre and of uncertainty.

The process which led to the configuration of the network starts from the first project, "*I Turismi*", promoted by Confindustria, Federmanager and Fondirigenti, in collaboration with industrial associations of the South, establishing itself in the first phase as a network of companies. In 2019, the Network evolved by starting the establishment of an innovative SRL, in which a several number of members which were part of the National Promoting Committee³ became part of the nascent start-up. Indeed, in 2021, the Configuration of the National Promoting Committee consists of over 650 Italian municipalities, representing 93 Italian provinces, already formally joining the committee of the project, as well as the most important associations and foundations. Today it has gone from being national to international and is currently made up of over 1,250 institutions and over 11,000 private individuals.

The governance model of RDS is designed to promote a collaborative approach to sustainable tourism development between public and private entities, aimed at facilitating sustainable tourism in the southern regions of Italy; in which all stakeholders have a voice in the decision-making process, and work together to achieve common goals. The network is governed by a board of directors that includes representatives from various stakeholder groups, including local communities, tour operators, hoteliers, associations, foundations, and other tourism industry stakeholders.

This initiative is so much meaningful and significative that the press was interested in this topic, publishing a huge number of articles in newspapers and online magazines, underlying the growth and the expansion of this entrepreneurial strategy. The relevance of the network has been emphasized by the attention of third actors in the initiative, constituting a real CAS.

The motivation behind the choice to build a network has undoubtedly to be found in the need to connect all the actors around a common project and which would allow everyone, despite the heterogeneity of interests in the field, to derive effective benefit for themselves and for the reference area.

The strength and the replicability of the model launched lies in two innovative factors:

1. bottom-up approach, i.e., from the direct involvement of the actors of the entire territorial offer made up of the operators of tourism, oenology, agri-food and crafts;
2. the integration between territorial tourism promotion and electronic commerce, giving life to the first *integrated Marketplace solution* built around the identity of the territories.

"We are convinced that our project responds to two fundamental needs, too often ignored. The first need is to give life to NEW promo-marketing models of the integrated territorial offer, MODELS DEVELOPED TOGETHER with local operators and built AROUND THE IDENTITY

³ The National Promoting Committee are listed below:

- Municipalities; organizations of national importance: associations - federations - development agencies
- organizations of national importance: Foundations
- organizations of national importance: business networks - consortia - networks
- other bodies and associations of regional and national relevance
- organizations of regional importance: Gal - mountain communities - parks
- organizations of Italians in the world
- other subjects who have expressed an interest in supporting the initiative.

and for the sustainability of the territories. The second need is to intercept the question where it arises, on digital, in order not to abandon it to global platforms that have no interest in enhancing the richness and diversity of Italian heritage, represented by tourism, food and wine, made in Italy.” (Michelangelo Lurgi, CEO of Giroauto Travel Sas, Confindustria Salerno, “Mettiamo in rete il territorio”).

Moreover, the particularity of this project is inherited in the interplay between the *bottom-up* and the *top-down* approaches, which give the network of local actors a form of legitimacy through the institutional recognition of their actions.

The actions proposed by the network not only go in the direction of strengthening the relations, but mostly in the attempt to contribute (by taking an active part) to the decision-making process or to political debate. Even more, the relational dynamics that led to the structuring of the network allow to the governance to structure the IW through public affairs, lobbying strategies and pressures, directly moving in institutional corridors to favour an active position for them and, at the same time, legitimate the representation of their interests. With these relational dynamics, we refer to *bottom-up* actions of IW, as briefly described below.

Among the initiatives, we can mention the Actions promoted aimed at acquiring legitimacy to act, both at a social and juridical level (i.e., signing memoranda of understanding). It could be interesting to take into consideration the actions undertaken by the founding actors of the network, on the national territory of affluence, undoubtedly aimed at creating a single system legitimized to act in the institutional field. The reference is to all the memoranda of understanding signed with the Italian Regions and Municipalities (Southern Italy and the Islands), with particular reference to the 2023-2028 Return Programme. The choice of the form of memorandum of understanding appears emblematic from an organizational point of view, because they configure a juridical institution with guiding value, aimed at orienting strategic actions on objectives shared by the parties that share common interests.

Furthermore, the Creation of the “Tourism and Destinations Forum” which, to date, envisages the participation of 150 Speakers and over 1500 including stakeholders, opinion leaders, institutions, companies, consortia, foundations, associations, citizens involved for the purpose of discussing touristic topics regarding Southern Italy. All these actors are called to plan improvement actions, trying to understand the advantages and to improve the organization in view of catching the resources and optimizing results.

The debate among actors continues on social networks (with particular reference to the Facebook social channel), as a place for discussion and comparison for the convergence of ideas, interests and objectives to be implemented at an institutional level.

To reinforce the institutional role of the network, RDS requested and received, regarding the “2023 Year of Return Tourism” initiative, the participation in the Conference of Regions (May 2022), has granted patronage to the entire initiative with a favourable opinion from all the tourism councillors of the Italian regions.

The various initiatives, aimed at involving local institutions concerned in RT, converge in the establishment of a National Technical-Scientific Committee, with the participation of sector experts, to better formalize the institutional role in representing common interests and, at the same time, widespread throughout the territory.

In the field of IW, actions can also take the form of pressures on Institutional and Political authorities, so that they can influence the decision-making process.

A recent example in the history of the network is represented by the Audition at the Senate of the Italian Republic at the Commission for Industry in December 2021, in which President Michelangelo Lurgi was summoned to a hearing at the Presidency of the X Committee. In that occasion, he presented the initiative “2023 Year of Return Tourism. Discovering the Roots” and explained the necessity of interventions for the redevelopment of the villages of Italy.

In the same way, the network presented “Return to Italy 2023-2028 project” in Brussels at the headquarters of the European Parliament, to highlight the program to the Representatives of the European Parliament.

As a result of the pressure actions, it is interesting to note recent initiatives promoted by the institutional bodies, with the aim to involve the network in the political debate with a view to defining sector policies.

By way of illustration, we can consider their participation at the headquarters of the Chamber of Deputies in the hall of Parliamentary groups in June 2022. During that parliamentary sitting the network presented the "2023 Year of Return Tourism" to government Representatives and Ministries.

Valuable of being mentioned is also the recent Convocation of audition in the Senate of the Republic in December 202, in which RDS was summoned to debate on the topic "PNRR Borghi", as an expert of the sector issues.

Both *bottom-up* and *top-down* processes contribute to define the ideal boundaries of the 'contextualized space' - an OF in an Institutional perspective - in which all the actors involved are, at the same time, object and subject of the pressures that cross the field itself (Bonazzi, 2002).

5. Final Remarks

In a socio-economic context, Roots Tourism could be an economic and social enhancement tool. Thus, our study has shown the important role of the engagement of very diverse actors and stakeholders interested in structuring a network able to pursuing the tourism development by the territorial heritage through the interest of descendants for their own origins and knowledge of the places of their ancestors.

Furthermore, organizational coordination by a Concrete Action System (CAS), we noted, could accelerate and amplify the institutional change to face the challenge to intercept the opportunities deriving from a new segment market. Following the analysis regarding the concepts of Organizational Field (OF), Concrete Action System (CAS) and Institutional Entrepreneurship (IE), and Institutional Work (IW), we can reach the conclusion according to which the birth of networks between entrepreneurs, socio-economic actors of the territory and multilevel institutional actors, can give life to important entrepreneurial initiatives (as did RDS) to start new and significant governance models for the socio-economic development of places that have suffered migratory flows some time ago.

The case study could be considered as the first multilevel account of an interplay between managerial practices, organizations' goals, and institutional logics, aiming at supporting the tourism development. Here, we can observe two interactive processes. Firstly, the institutional change could arise from the "periphery" of the large tourism field because the agents engaged in the Concrete Action System are going to play an important role into the institutional level. Further, the policy maker requires active interpretation at a local level encouraging, in this way, a more and more efforts made by the agents.

The present work has yielded important insights into why, where, and how a CAS like RDS might be helpful, to foster the tourism promotion, especially in the presence of institutional voids. Indeed, building markets is neither easy nor unproblematic, and if the RT might be considered as a new vital segment for Italian economy, the opportunities deriving from it cannot be relegated to a local or organizational arrangements level.

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Digital platform ecosystems: A multi-layer analysis of their emergence in rural areas

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Abstract

Framing of the research. *Digital platform ecosystems have quickly emerged as a promising stream of research in entrepreneurship and innovation literature (Jacobides et al., 2018). In recent years, the digital platform phenomenon has interested the agri-food activities (Annosi et al., 2020).*

Purpose of the paper. *The study aims to deepen our understanding of the processes and mechanisms underlying the emergence of platform ecosystems in rural areas.*

Methodology. *Adopting a single case study design on an experimental initiative to create an integrated multi-chain digital traceability platform, we empirically examined the relationships between participants in an ecosystem to model the context in which they create value.*

Results. *We studied the initiating process of a digital platform ecosystem distinguishing between the design and launch phase and identified the key role of the orchestrator as an independent entity pursuing collective interests.*

Research limitations. *This study is limited to companies operating against the backdrop of a shared project to create a digital platform ecosystem.*

Managerial implications. *Our study highlights how firms can manage the adoption of digital technologies by exploiting external collaborations. Moreover, we offer a multiplayer perspective of the mechanisms behind traditional sectors' innovative efforts operating in rural areas.*

Originality of the paper. *Although digital platform ecosystems have been the subject of numerous studies in the agri-food sector, to the best of our knowledge, there is no comprehensive and exhaustive exploration of the phenomenon within a rural area, where ecosystem participants combine efforts to create value in an innovation-hostile environment.*

Key words: *digital platform ecosystems; rural areas; blockchain; agri-food*

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1. Introduction

In recent years, agri-food companies have started to build digital platform ecosystems to implement complex value propositions (Gawer and Cusumano, 2013; Jha *et al.*, 2016; Calabrese, La Sala, Fuller, and Laudando, 2021). Along with this orientation, they have been regarded as collaborative arrangements through which companies combine their individual offerings into a coherent, customer-facing solution, at the core of which is a technology platform and/or a set of shared resources, standards, and interfaces (Ceccagnoli *et al.*, 2012; Gawer, 2014). The value creation depends on complementary inputs from interconnected but hierarchically independent heterogeneous stakeholders, typically orchestrated by a focal actor capable of coordinating all participants and introducing a series of actions to shape the context in which they collaborate and compete (Thomas and Ritala, 2022).

While there is increasing research on established agri-food platform ecosystems (e.g., Tsolakis *et al.*, 2021), much less work has addressed the creation of a *de novo* ecosystem within a rural area and the development of a shared structure of interactions. Moreover, establishing platform ecosystems - not an easy feat in itself - is particularly difficult in rural areas, where geographical, cultural and socio-economic barriers can inhibit the adoption of emerging technologies (Rijswijk *et al.*, 2021; Schrieck *et al.*, 2021). In such a hostile context to change, the role of orchestrators becomes even more critical to initiate and manage the construction and collaboration of innovation networks, which represent valuable tools to connect the countryside to the digital economy and achieve a more modern and sustainable future for the agri-food industry (Trendov, Varas and Zeng, 2019).

Responding to the call for more contextualized studies on digital platform ecosystems (Gulati *et al.*, 2012; Jacobides *et al.*, 2018), in this article, we aim to deepen our understanding of the processes and mechanisms underlying platform ecosystems' emergence in rural areas. Accordingly, adopting a single case study design (Eisenhardt, 1989) on a project just started in the Sicilian hinterland, we focus on the emergence of a digital platform ecosystem and the role of the orchestrator at this evolutionary stage. Then, drawing on a series of primary interviews and extensive secondary data, we scrutinize the initiation process of a digital platform ecosystem by distinguishing between the *design* and *launch* phases. Specifically, we identify the set of activities through which a focal actor defines strategies, mobilises and aligns with other actors and their resources while orchestrating the digital transformation of areas hostile to change. Accordingly, we shed light on how the orchestrator plans the ecosystem and the actions implemented to motivate participation and govern it.

The rest of this paper is organized as follows. Section 2 draws a conceptual framework on digital platform ecosystems, the orchestrator and the process of technology adoption within them. Section 3 presents the methodology and research design. Section 4 provides a brief introduction to the reference context of the project and the characteristics of the companies involved. Section 5 presents findings by analyzing orchestrator activity from a two-layered perspective. We conclude with a discussion and conclusions in section 5, highlighting some limitations of the study and some practical implications of the results.

2. Theoretical framework

Digital platform ecosystem

Digital platform ecosystems have quickly emerged as a promising stream of research in entrepreneurship and innovation literature (Jacobides *et al.*, 2018). They have been broadly conceived as forms of endogenous strategic action where autonomous agents contribute to the digital platform's value proposition (Teece, 2018). Whereas traditional firms create value within the boundaries of a company or a supply chain, digital platform ecosystems drive co-production, co-creation, and value capture (Hein *et al.*, 2020). They are built on collaborative arrangements

between firms that combine individual offerings to create a coherent solution aimed at a defined audience and share a set of technical standards (Adner, 2006; Thomas and Autio, 2020). As the participants in the ecosystem depend on each other, the digital platform ecosystem offering requires careful orchestration of actors and resources. Even if most digital platforms act as private regulators of their ecosystems (Gawer, 2021), they facilitate transactions and innovation under the coordination and direction of the platform orchestrator (Wareham, Fox, and Cano Giner, 2014, p. 1211). Orchestrators establish the rules through which their various actors interact, decide what behaviors to encourage or discourage on the platform, and choose how to enforce them (Autio, 2021).

In recent years, the digital platform phenomenon has interested the agri-food activities that have been reorganized around platform-based ecosystems for value creation and appropriation (Annosi *et al.*, 2020). Digital technologies, such as IoT and Blockchain, have been exploited to collect and record data to create efficient, transparent, and sustainable supply chains, and more often, digital platform ecosystems have proven necessary for firms operating in the agri-food sector (Tsolakis *et al.*, 2021). For example, the adoption of Blockchain technology in terms of recording, storing, validating, and securing data can solve various agricultural problems such as business financing. Previous research has demonstrated that if the banking and insurance industries are connected in real-time to activity data in the agricultural industry, they can create better credit ratings and profile models (Rijanto, 2021). Additionally, in a context where consumers have become more educated at the bottom of the supply chains and demand real-time updated information on foods they consume, digitalization has allowed the agri-food industry to be highly connected, efficient, and responsive to customer needs and regulatory requirements. The Covid-19 pandemic has also increased the reliance from individuals, businesses, and governments on online platforms. As a result, food product traceability, safety, and sustainability issues have become crucial concerns to food retailers, distributors, processors, and farmers. It has forced actors to accelerate the adoption of digital agriculture technologies to support emergency responses, making the issue especially topical and increasing institutional pressures that demand actors to participate in a traceability system (Hew, Wong, Tai, Ooi, and Lin, 2020). However, the rise and deployment of digital platform ecosystems in the agriculture and food industry are challenging and resource-demanding and can prove particularly difficult within rural areas, where factors related to geographical, social, institutional, and market access conditions can act as barriers to environmental change and innovation (Baumber *et al.*, 2018, Miles and Morrison, 2018). Despite the intervention of the orchestrator, more conservative firms may not perceive this strategy favorably, holding them back from participating in the ecosystem and adopting digital technologies (Hew *et al.*, 2020). In this context, ecosystem leaders must persuade others to make voluntary inputs consistent with the ecosystem's overarching value offering. As such, in line with institutional theory (DiMaggio and Powell, 1983) that posits the influences of external institutions in driving isomorphism between firms (Yigitbasioglu, 2015), the orchestrator could exert pressures (coercive, mimetic and regulatory) on firms influencing their perceptions about digital systems (Hu *et al.*, 2016; Yigitbasioglu, 2015) and motivating their intentions to adopt (Teo *et al.*, 2003).

Orchestrating the emergence of a digital platform ecosystem

Research on the emergence of digital platform ecosystems has often focused on their structure, examining the actors involved and their linkages to establish a common value proposition (e.g., Özalp *et al.*, 2018; Rong *et al.*, 2015; Pan Fang *et al.*, 2021). Specifically, some studies shed light on the role of the orchestrator, namely the entity that provides key resources and infrastructure and regulates linkages between complementary actors to initiate the ecosystem and give it momentum (e.g., Autio, 2022; Mann *et al.*, 2022; Das and Dey, 2021). Most of them identify the orchestrator with a focal firm operating in a highly innovative industrial setting, namely a large, powerful, and established organization with the knowledge, resources, and key technologies to stimulate the emergence of an ecosystem and profit from it (e.g., Lingens *et al.*, 2022; Das and Dey, 2021; Hou *et al.*, 2020). In large rural settings, micro and small enterprises attached to traditional values, often

geographically isolated due to low entrepreneurial density and lack of infrastructure, lack the strength to stimulate the emergence of an ecosystem (Ferrari *et al.*, 2022; Hammer and Frimanslund, 2022). In these contexts, the ecosystem may be triggered by an external catalyst, namely a third party with a strong relational position. In contrast to focal firms, external orchestrators pursue collective interests - for example, social or environmental or industry interests - and aim for network vitality to foster the diffusion of innovative ideas in highly uncertain environments (Hurmelinna-Laukkanen and Nätti, 2018). Moreover, in wide rural areas, these orchestrators may leverage public and private actors strongly rooted in the local microenvironment to legitimize the ecosystem and introduce it to potential complements, building a shared understanding of its purpose within the broader economic and social context (Thomas and Ritala, 2021; Lingens *et al.*, 2022; Rogers, 1961).

Orchestrating the participation in a digital platform ecosystem

The emergence of studies on digital platform ecosystems has encouraged researchers to scrutinize the decision-making processes that drive complementary autonomous agents to join a platform (Boudreau, 2010; Church and Gandal, 1992; Gawer and Henderson, 2007; Zhu and Iansiti, 2012). Most existing studies on how platforms attract complements often assume that they possess detailed information on the participants, the technologies involved in the regulatory issues related to data governance, or the ecosystem's value proposition. While this assumption may hold in some established platform ecosystems, in emerging ecosystems, the set of platform actors may not be clear, as well as the information regarding its functioning or long-term sustainability (Dattée *et al.*, 2018; Hannah and Eisenhardt, 2018; Pan Fang *et al.*, 2021). Moreover, in rural contexts, where average levels of education and skills are generally lower, fear of change and mistrust of technology disincentivize the adoption of emerging technologies and participation in a digital platform ecosystem (Ferrari *et al.*, 2022; Malecki, 2003; Salemink *et al.*, 2017). In scenarios of high uncertainty, the orchestrator plays a key role (Thomas and Ritala, 2022). In fact, the orchestrator must have a clear 'proto-vision' of the ecosystem and must convey this to potential complements to convince them to take part in overcoming critical mass and generate those indirect network effects typical of ecosystems (Dattée *et al.*, 2018; Katz and Shapiro, 1985; Rogers, 2003). Previous research has shown the importance of conferences and workshops organized in person to attract possible users, introduce them to the platform and reduce perceived uncertainty about new technology (Dattée *et al.*, 2018; Garud, 2008; Özalp *et al.*, 2018; Pan Fang *et al.*, 2021). Specifically, in these meetings, the platform is proactively publicized to stimulate awareness among potential users (Cusumano and Gawer, 2002; Rogers, 2003). In this context, participants may influence each other, and early adopters may motivate adoption by sharing their experiences and taking a significant role in the education and training of potential users (Attewell, 1992; Bandura, 1986; Pan Fang *et al.*, 2021). Even in rural communities, in-person workshops appear to support the dissemination and adoption of digital technologies, contributing to peripheral areas' social and economic progress (Raisänen and Tuovinen, 2020). In this context, the orchestrator may leverage ecosystem partners that motivate entrepreneurs to attend conferences and training workshops through incentives (Pan Fang *et al.*, 2021). However, the deployment of a digital platform in contexts of high uncertainty is not immediate but recognizes time as a critical element of innovation and requires iterative and recursive feedback loops - positive and negative - concerning the use of emerging technologies, which may lead to a more or less homogeneous intersubjective convergence (Vargo, Archpru Akaka, and Wieland, 2020).

3. Methodology

We adopted a single case study design to highlight the emergence process of a digital platform ecosystem in a rural context (Eisenhardt, 1989). A single case study allows for an in-depth exploration of a phenomenon, representing an appropriate design to test a theory in a specific context, analyzing an unusual situation worth documenting and investigating a longitudinal case

where certain conditions and underlying processes change over time (Yin, 2018).

The present study was conducted on an experimental initiative sponsored by public and private actors to promote the territorial development of peripheral areas. The project aims to create an integrated multi-chain traceability digital platform, enhance the UNI EN ISO 22005¹ certified Sicilian agrifood supply and promote the development of local economies. The designed system is based on the integration of various digital technologies - such as, Blockchain technology and IoT - capable of recording information from the entire production process and ultimately making it accessible to the end consumer. The project involves a total of 194 enterprises - voluntarily adhering to the initiative - located in the rural areas of Sicily (Figure 1). Participants include farms, processing firms, and packagers operating in eleven different supply chains, as detailed in Table 1.

Data collection began in February 2022 and ended in February 2023. To ensure the triangulation of data and the robustness of our research results, the data collected comes from primary (semi-structured interviews) and secondary data (desk analysis and information from the project kick-off meeting) (Benbasat *et al.*, 1987; Dubé and Paré, 2003; Eisenhardt, 1989; Yin, 2018).

Building on theoretical sampling (Glaser and Strauss, 1967), we conducted twenty-two semi-structured interviews. We selected companies that produce differentiated agrifood products and operate at different supply chain stages among the available companies. In addition, we considered farms of various sizes. These choices lie in the possibility of highlighting variations between trials and identifying categories in terms of properties and dimensions (Strauss and Corbin, 1998). Thus, we involved nineteen company representatives. Furthermore, we interviewed the certification agency's project manager and two project promoters, namely the project leader and a spokesperson for the regional policymakers to understand better the goals and the expected impact of the initiative on the local environmental development.

All interviews were conducted in Italian, some on an online videoconferencing platform (MSTeams) and others over the phone. They lasted between 20 and 90 minutes and were recorded, transcribed and subsequently translated into English. At the beginning of each interview, we explained the objectives of the study and the ethical issues surrounding it. We designed an interview outline consisting of eleven open-ended questions. The interview guide had two main sections of questions. The first section allowed informants to provide general considerations about their participation in the project and the role of the organizers. The second section explored how managers in the agri-food sector perceive digital transformation, highlighting the challenges and opportunities. Table 5 presents the twenty-two key informants, their job position, and the duration of the interviews. In addition, for the key informants of the nineteen companies, we indicated the type of company they work and the supply chain in which the company operates.

We collected secondary data from archive documents (e.g., executive plan of project activities) and the official project website. In addition, we gathered information from the kick-off meeting held in February 2022. Table 6 shows a summary of the secondary data sources.

Data analysis used familiar approaches for inductive studies, and we had no a priori hypotheses. We read the cases independently to form our views of each actor's role in participating in the ecosystem. We began with detailed written accounts and schematic representations. We triangulated the primary data with secondary data, enriching the thematic analysis to the point of saturation (Strauss and Corbin, 1998). After constructing each profile, we conducted within-case analyses, which were the basis for developing early constructs surrounding ecosystem emergence as experienced by each actor. Cross-case analysis produced our working framework of the ecosystem emergence and orchestration. The blended approach allowed us to remain open to surprises in the data while ensuring theoretical consistency from the outset. The results of the data analysis are presented and discussed in the following sections.

¹ UNI EN ISO 22005:2008 is an international standard for the certification of agri-food traceability systems. Its objective is to support companies in documenting the history of the product, enabling its origin to be traced.

4. Reference context and general features

The project is set in the rural areas of Sicily's nine provinces, which characterizes 96% of its 25,711 km² surface area (ISTAT, 2010).

The richness of these territories in terms of biodiversity and quality native crops clashes with the poverty of infrastructure and services that affects, above all, the region's innermost areas. In fact, they have a tangible and intangible infrastructure network - road and rail networks, broadband, telematics and logistics networks - that is extremely deficient. The absence of an extensive highway network forces the use of rural, often rutted roads, which affects the travel time of agri-food goods, particularly penalizing products for fresh consumption. In addition, many inland areas due to land morphology and low population density have low connectivity or no broadband at all. In these difficult contexts, the lack of essential services severely affects the quality of life of rural communities, fostering depopulation in hard-to-reach areas and hampering the potential for business creation and development.

The enterprises participating in the pilot project operate in eleven different supply chains, as detailed in Table 1. The distribution of participating enterprises shows a prevalence in the Extra Virgin Olive Oil and Wheat sectors, traditional quality crops of the Sicilian hinterland. In last place in terms of numbers, we find operators in the exotic fruit and its derivative products supply chain. This is a booming market, especially in the Tyrrhenian strip of Messina (ME), which offers favorable environmental conditions for tropical fruit production.

General information on participating firms is provided in Tables 2, 3 and 4, acquired through the Orbis - Bureau Van Dick database. Since 44 of the 194 participating enterprises are sole proprietorships - a type of enterprise not found in the database - the tables contain general information for 150 enterprises and financial and governance information for a variable and further reduced number of organizations. In more detail, Table 2 contains some descriptive statistics for each supply chain and for the entire group, while Table 3 details some information by sector. Finally, Table 4 provides some information on the management and supervisory bodies of the enterprises, where available.

Enterprises participating in the initiative are micro and small enterprises. In general, the size of these types of enterprises - which characterize the rural areas of inland Sicily - is responsible for excessive fragmentation of the production fabric and poor vertical integration between production phases. Due to their small size, only 23 out of 150 enterprises - that is, 15.3% - have branches and only 6 out of 150 enterprises - that is, 4% - have more than one branch. Excessive fragmentation of production makes it impossible to achieve economies of scale and reduce and optimize operating costs, causing many sectors to be unprofitable. Despite the presence of well-established enterprises - with an average age of 14 years - profits are limited and, in some cases, such as in the vegetable and prickly pear and derived products sectors, there are large losses.

43% of the member enterprises - that is, 84 out of 194 companies - operate in two or more certified supply chains. The existence of multi-product enterprises transcends the verticality of the supply chain and creates a complex cross-system - the so-called ecosystem - in which each organization must interact with operators in other supply chains.

Participating micro and small businesses have a low rate of digitization: only 30% of them have already invested in digital technologies, setting up a website. This figure suggests that digital transformation is proceeding very slowly and confirms the existence of a digital divide that is severely limiting the development of peripheral areas. The highest percentage of businesses present on the web belongs to the supply chain of legumes, hemp, aromatic-officinal plants and derivatives, honey, and that of wheat and its derivatives.

Male presence at the top of the boards prevails over female presence, but the latter seems to be gaining ground, despite the cultural backwardness of the Sicilian hinterland. In fact, Table 4 shows that 70% of CEOs are men and 30% are women. There is also a female presence in other board roles and on the boards of auditors. Most of the members of the governing and supervisory bodies are between 25 and 49 years old, but there are numerous members over 50. The presence of young

people is still too limited, reflecting the reduced generational turnover that characterizes the Sicilian agribusiness sector, due to which the digitization process is not taking off.

The business strategy of the companies participating in the pilot project focuses on the high quality of niche regional agri-food products, which include raw materials, semi-finished and finished products. To try to bring down prices and be competitive in the market dominated by multinationals, their policy is to try to optimize production costs and, in particular, those of harvesting, which is normally done by mechanical means.

5. Findings

In this study, we describe the emergence of a digital platform ecosystem to enhance and integrate the distinctive features of rural areas. We structure our findings through the design and launch phases of the platform, highlighting the activities carried out at each stage to bring the ecosystem to life and populate it and the feelings of its actors. Specifically, we identified the role of the orchestrator as the project leader - designed as an external actor with no direct interest in the supply chains - and its contribution in maximizing the ecosystem's value co-discovery potential.

5.1 Designing the digital platform ecosystem

The design phase describes the orchestrator's motivations for triggering the ecosystem creation process, then the design idea and the construction of the platform.

Developing a future vision

The project originated by an independent entity with a strong relational position, in response to the need to enhance the rural areas of Sicily. In a context characterized by the poor capacity for aggregation on the part of the production system - due to the small size of enterprises and the low propensity for cooperation -, the initiative was conceived as an opportunity to foster local collaboration, aimed at enhancing the territory and its resources according to a participatory approach. In fact, KI-1 (Project Leader - interviewed on 11 February 2022) revealed: «[...] the project aims to network small businesses and foster a system approach between disadvantaged territories, from which to generate a common return. [...]. This is a very ambitious project aimed at making attractive inland areas dominated by feelings of distrust and abandonment.»

Although aware that embarking on a digital transformation journey would be very difficult in such a change-hostile environment, the initiative was seen as an opportunity for a change of mindset. KI-1 revealed that: «Cultural resilience takes time, consistent messages, and the ability to convince businesses to change. Through the help of partners, we raise awareness of the digital transition among agricultural producers and provide them with all the assistance they need to persuade them to join a potentially revolutionary project for the area.»

The complexity and ambition of the project justify its conception and management by an independent entity without economic interests, which takes on the role of orchestrator. KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022) said: «You understand well that such a project would be neither thinkable nor feasible by individual companies.»

The project idea

The core of the project is the creation of a digital platform integrated with an international traceability standard to prove the Sicilian origin of agri-food products, to which are added targeted commercial interventions to promote an image of the products related to the specificities of the area. KI-2 (Spokesperson for the regional policymakers - interviewed on 16 February 2022) explained: «[Valore Sicilia] intends to ferry rural communities into the world of digital technologies at the service of quality Sicilian food, certified according to the UNI EN ISO 22005 standard.» To complement this, it envisages the creation of a direct sales circuit to market the products and link

the network of businesses with promotional and commercial initiatives carried out by regional, national and international organizations and operators. KI-1 (Project Leader - interviewed on 11 February 2022) stated: « [Through these interventions] we would like to make very small local businesses visible in national and international markets [...] that alone could not make it.». In addition, KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022) stated: «The project provides an innovative solution that could in time also be integrated with other projects, such as food and wine tourism.».

Digital platform structure

The project leader relied on an external agency to define the technical and organizational architecture of the digital platform, implemented through public funds. On its features, during the kick-off meeting, the certification agency stated that: «We designed a Blockchain Azure platform for digital traceability, in compliance with UNI EN ISO 22005, accessible to all companies that will join. It is a modular multi-chain architecture, which will allow each operator to record and share information about each agri-food product. Each adhering company will only have access to its own data, which, however, will be immutable. In contrast, the project leader will have an overview, being able to access all data.». Moreover, he added: «We defined smart contracts to regulate transactions within the platform and implemented a traceability system that may involve many digital technologies. In the future, it will be the basis for building innovative forms of communication, so-called smart labels, through which the end consumer, after framing a digital label on the foodstuff packaging with his smartphone, will be able to trace the origin of the product».

As designed, the platform connects all participating companies, enabling them to create complementary offerings. Again, the certification agency said: «It [the platform] generates a complex network of linkages between multiproduct supply chains, which overcomes the traditional vertical view of each supply chain in favor of the rise of a cross-sector ecosystem, in which each actor will take on a defined role based on its position along the supply chain: i.e., farm and/or processor and packer.».

5.2 Launching the digital platform ecosystem

The launch phase of the project required the orchestrator to find ways to 'open' the platform to potential complements. The orchestrator's approach thus shifted from an inward focus in the conception phase to an outward focus to attract users.

Developing consensus

The strategies implemented by the focal actor to develop consensus among potential complements focus on the promotion of the ecosystem as a certification system to enhance the economic and social potential of local products and the entire territory. Often, the project leader leveraged public and private partners with strong local roots to present the platform and its objectives to potential users. KI-10 (Owner and Legal Representative - Prickly pear and prickly pear products supply chain, Dried fruit and derivatives products supply chain, Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Extra virgin olive oil supply chain, Vegetables and their products supply chain, Grape and grape products supply chain - interviewed on 28 March 2022), KI-13 (Administrator - Extra virgin olive oil supply chain - interviewed on 2 February 2023), KI-14 (Owner - Dried fruit and derivatives products supply chain, Extra virgin olive oil supply chain, Wheat and derivatives supply chain - interviewed on 4 February 2023), KI-15 (Owner - Extra virgin olive oil supply chain - interviewed on 10 February 2023) and KI-22 (Owner - Wheat and derivatives supply chain - interviewed on 12 February 2023) stated that they got to know the project thanks to the trade associations they belong to, during meetings where the focal actor was present. KI-10 explained: « [During one meeting] he described the project in broad outline, convincing me to look into it further in the following days.». On the other hand, KI-

20 (Owner - Extra virgin olive oil supply chain, Grape and grape products supply chain - interviewed on 12 February 2023) stated: «I got to know [the initiative] thanks to a discussion with a project partner company that operates in the same supply chain as us.».

In addition, the orchestrator organized information meetings on the project and again used partners to encourage the participation of member companies. For example, the professional associations - partners in the initiative - entered into advantageous agreements with the orchestrator, awarding training credits to members.

However, a few interviewed companies judged the promotional efforts made by the orchestrator to attract more traditional companies to the platform as still too weak due to cultural resistance typical of the rural world. For this reason, KI-2 (Spokesperson for the regional policymakers - interviewed on 16 February 2022) hoped for more publicity efforts. He stated: «The orchestrator must facilitate early participation, emphasizing the urgency of the ecosystem to overcome the digital divide that characterizes peripheral territories». According to KI-9 (Founder - Citrus and Citrus Products Chain, Extra Virgin Olive Oil - interviewed on 3 February 2022) some companies will join the project in the future. He stated: «Currently, more traditional companies do not understand the advantage digital traceability certification offers. Many local companies, despite promotional efforts, have chosen not to join the project. In order to convince reluctant companies, it will probably be necessary to show them a definite advantage, such as returns from the market.».

Empowering ecosystem actors

The orchestrator promotes free training courses on the use of digital technologies and leverages partners to incentivize the participation of their member companies. Once again, the professional associations - partners in the initiative - enter into advantageous agreements with the orchestrator, awarding training credits to members. In this regard, KI-1 (Project Leader - interviewed on 11 February 2022), KI-2 (Spokesperson for the regional policymakers - interviewed on 16 February 2022), KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022), KI-10 (Owner and Legal Representative - Prickly pear and prickly pear products supply chain, Dried fruit and derivatives products supply chain, Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Extra virgin olive oil supply chain, Vegetables and their products supply chain, Grape and grape products supply chain - interviewed on 28 March 2022), KI-12 (Owner - Processor and packager - Citrus fruit and citrus fruit products supply chain, Cheese supply chain, Dried fruit and derivatives products supply chain, Wheat and derivatives supply chain - interviewed on 7 April 2022) and KI-19 (Owner - Exotic fruit and derivatives products supply chain - interviewed on 11 February 2023) agreed on the usefulness of training activities to assist companies in introducing and maintaining digital innovation. Finally, KI-7 (Quality Manager - Vegetables and their products supply chain - interviewed on 22 February 2022) recognized the value of training courses in less structured, family-run businesses, where «often the owner is elderly and not very familiar with technology». In particular, KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022) stated that, given the complexity of the project and the number of technologies involved, training activities are essential to bring companies towards a cultural change and make them autonomous in the management of digital tools. In fact, without such actions, digital tools risk becoming just an expensive frill for the participating companies. According to KI-7, «those who do not have these skills will slow down all the others. Ad hoc training courses allow us all to start from the same level».

However, some companies' representatives negatively evaluated the communication strategy implemented by the orchestrator and called for its improvement. For example, KI-8 (Quality Manager - Wheat and derivatives supply chain - interviewed on 25 February 2022) said: «There is a need for better communication of what the project envisages in practice. Some of our suppliers did not want to participate because they did not understand what they had to do (i.e., keeping formal records). Not being able to include them in the traceability system will be detrimental to us.».

Similarly, KI-6 (Founder and Company Partner - Citrus fruit and citrus fruit products supply chain, Wheat and derivatives supply chain, Extra virgin olive oil supply chain - interviewed on 24 February

2022), KI-10 (Owner and Legal Representative - Prickly pear and prickly pear products supply chain, Dried fruit and derivatives products supply chain, Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Extra virgin olive oil supply chain, Vegetables and their products supply chain, Grape and grape products supply chain - interviewed on 28 March 2022) and KI-11 (Administrator - Wheat and derivatives supply chain - interviewed on 5 April 2022) recognized the value of effective communication, through which a growing number of companies will be able to understand the project and its potential benefits. As a result, companies will be able to organize themselves to welcome the change.

Governing the ecosystem

The orchestrator is responsible for defining the game's rules, codified within a regulatory framework and the confidentiality agreements for sensitive data. Also, the project leader will monitor the correct application of the established procedures through periodic checks and appropriate tools, such as traceability tests and mass balances. On this matter, KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022) stated: «The orchestrator will be the owner of the data. He will keep an eye on all the information at the dashboard level, which individual companies will not be able to access for privacy reasons». Furthermore, KI-8 (Quality Manager - Wheat and derivatives supply chain - 25 February 2022) recognized the orchestrator as «the entity that will dictate the guidelines and periodically check that all the companies - and there are many of them - are doing things correctly». Many interviewees evaluate the role of the orchestrator positively. In this vein, KI-4 (Sales Manager - Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Livestock supply chain - interviewed on 23 February 2022) and KI-6 (Founder and Company Partner - Citrus fruit and citrus fruit products supply chain, Wheat and derivatives supply chain, Extra virgin olive oil supply chain - interviewed on 24 February 2022) agreed in defining the orchestrator as «a point of reference» to whom they can turn to discuss internal rules. Instead, KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022), KI-10 (Owner and Legal Representative - Prickly pear and prickly pear products supply chain, Dried fruit and derivatives products supply chain, Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Extra virgin olive oil supply chain, Vegetables and their products supply chain, Grape and grape products supply chain - interviewed on 28 March 2022) and KI-17 (Administrator - Vegetables and their products supply chain - interviewed on 11 February 2023) defined it as that key intermediary entity that coordinates all project-related activities in a constant, structured and precise way. Specifically, KI-3 (Certification's agency Project Manager - interviewed on 15 March 2022) stated: «It would be impossible to imagine a project of this tenor, of this innovative scope, without the presence of the orchestrator, without his coordination and, above all, without his intermediary activity».

However, some interviewees complained about the absence of an adequate number of consultants to support the orchestrator, on the one hand, in control activities and, on the other hand, in handling requests for clarifications from companies. Once participation in the platform grows and extends to smaller and less structured companies, it will become almost impossible to meet everyone's needs. For this reason, KI-7 (Quality Manager - Vegetables and their products supply chain - interviewed on 22 February 2022) said: «It needs to put more consultants alongside the orchestrator so that they talk to the individual companies in depth and accompany them step by step through the digital transformation process».

6. Discussion and conclusion

As part of a broader research project, the present study explores the mechanisms and processes for sustainable ecosystem emergence. In particular, we explore the opportunities and threats specific to rural contexts, focusing on how complex interrelated organizations can thrive and develop rather than fail in scaling up.

Despite being on an exploratory stage, the project will allow us to observe and closely monitor the evolution of such a digital ecosystem, shedding light on the role of external orchestrators and the relations among the other actors.

Although digital platform ecosystems have been the subject of several studies in the agri-food sector, there is no comprehensive and exhaustive exploration of the phenomenon within a rural area, where ecosystem participants join efforts to create value in an innovation-hostile environment.

However, this study is limited to companies operating against the backdrop of a shared project to create a digital platform ecosystem. For this research to have relevance in this area, more cases need to be involved, namely more similar food companies for the purposes of literal replication, and more different food companies, for the purposes of theoretical replication (Yin, 2018). Further research could consider expanding the range of respondents to include other supply chain actors to enrich the available data and increase the study's validity. In addition, more case evidence from other roles in supply chains would provide different insights and perspectives on the four layers of orchestrator activity. The youthfulness of the project forced us to limit our study to only the initiation stage of the digital platform ecosystem for value co-discovery. In the future, to provide more consistency to our results, the study could be extended to the momentum and control stages of the ecosystem. Finally, for the time being, the project's uniqueness makes it impossible to compare it with other similar cases on the national territory.

Managers and policymakers can use the preliminary research results of this study. First, our study highlights how firms can manage the adoption of digital technologies in the innovation process by exploiting external collaborations. Second, we offer a multiplayer perspective of the mechanisms behind traditional sectors' innovative efforts operating in rural areas. As policymakers are concerned, this study provides a helpful view on how digital platforms ecosystems emerge and the roles of orchestrators. Eventually, making a digital project successful can rely on selecting support and/or designing the right orchestrators from territories.

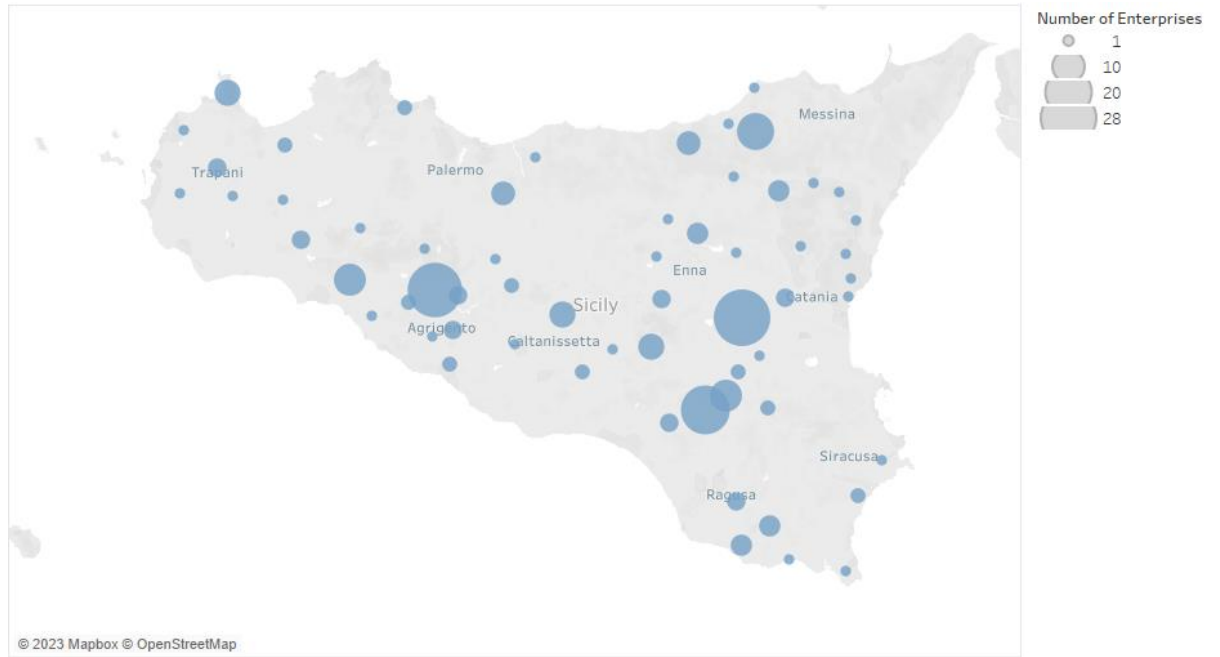
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Fig. 1: Places and operators involved in the project



Tab. 1. Number of companies operating in eleven different sectors

Supply chain	No. of companies
Extra Virgin Olive oil supply chain	62
Wheat and derivatives supply chain	55
Dried fruit and derivatives products supply chain	28
Pulses, hemp, aromatic-officinal plants and their products and honey supply chain	23
Citrus fruit and citrus fruit products supply chain	19
Vegetables and their products supply chain	19
Livestock supply chain	12
Grape and grape products supply chain	10
Cheese supply chain	7
Prickly pear and prickly pear products supply chain	7
Exotic fruit and derivatives products supply chain	5

Tab. 2. Descriptive statistics

		Obs.	Mean	Std. Dev.	Min	Max
All companies	Web Presence	150	.333	.473	0	1
	Firm age	150	13.673	10.312	1	57
	Multi-chain	150	.407	.493	0	1
	Branches	150	.153	.362	0	1
	Multi-branches	150	.04	.197	0	1
	Sales and Services Revenues*	56	2940.754	10919.739	0	78185.688
	Total Production*	73	2515.856	10582.472	0	86870.563
	Net income*	56	37.041	187.26	-	1319.054
				181.719		
Extra Virgin Olive oil supply chain	Web Presence	62	.306	.465	0	1
	Firm age	62	10.742	7.769	1	29
	Multi-chain	62	.694	.465	0	1
	Branches	62	.177	.385	0	1
	Multi-branches	62	.065	.248	0	1
	Sales and Services Revenues*	28	1299.62	2847.59	.75	14493.748
	Total Production*	32	1295.399	2581.682	12.95	13398.802
	Net income*	28	64.245	254.199	-110.98	1319.054
Wheat and derivatives supply chain	Web Presence	55	.455	.503	0	1
	Firm age	55	14.764	9.821	2	47
	Multi-chain	55	.545	.503	0	1
	Branches	55	.109	.315	0	1
	Multi-branches	55	.036	.189	0	1
	Sales and Services Revenues*	19	1040.25	1680.72	0	5665.908
	Total Production*	26	863.146	1522.392	0	5947.829
	Net income*	19	19.779	68.228	-61.511	248.847
Dried fruit and derivatives products supply chain	Web Presence	28	.214	.418	0	1
	Firm age	28	9.143	6.895	1	25
	Multi-chain	28	.714	.46	0	1
	Branches	28	.107	.315	0	1
	Multi-branches	28	.036	.189	0	1
	Sales and Services Revenues*	14	7091.454	20807.255	13.708	78185.688
	Total Production*	16	6733.011	21618.777	13.708	86870.563
	Net income*	14	33.583	91.585	-110.98	279.955
Pulses, hemp, aromatic-officinal plants and their products and honey supply chain	Web Presence	23	.478	.511	0	1
	Firm age	23	14.913	9.811	3	39
	Multi-chain	23	.913	.288	0	1
	Branches	23	.217	.422	0	1
	Multi-branches	23	.043	.209	0	1
	Sales and Services Revenues*	9	1072.818	1798.284	6.328	5665.908
	Total Production*	12	900.849	1657.08	8.896	5947.829
	Net income*	9	16.236	47.987	-61.511	102.632
Citrus fruit and citrus fruit products supply chain	Web Presence	19	.316	.478	0	1
	Firm age	19	17.684	13.901	3	57
	Multi-chain	19	.737	.452	0	1
	Branches	19	.211	.419	0	1
	Multi-branches	19	.053	.229	0	1
	Sales and Services Revenues*	6	988.915	2293.298	0	5665.908
	Total Production*	9	760.974	1947.9	0	5947.829
	Net income*	6	14.026	27.824	-3.201	67.043

Vegetables and their products supply chain	Web Presence	19	.421	.507	0	1
	Firm age	19	14.895	8.987	5	36
	Multi-chain	19	.526	.513	0	1
	Branches	19	.316	.478	0	1
	Multi-branches	19	.105	.315	0	1
	Sales and Services Revenues*	4	5783.265	11298.316	12.517	22729.248
	Total Production*	7	3548.613	8883.736	83.066	23693.98
	Net income*	4	-44.462	93.313	-181.71	24.391
Livestock supply chain	Web Presence	12	.167	.389	0	1
	Firm age	12	17.083	11.658	3	39
	Multi-chain	12	.25	.452	0	1
	Branches	12	.167	.389	0	1
	Multi-branches	12	.083	.289	0	1
	Sales and Services Revenues*	3	5188.657	8061.642	309.088	14493.748
	Total Production*	4	3676.56	6487.324	175.667	13398.802
	Net income*	3	103.794	154.032	-5.526	279.955
Grape and grape products supply chain	Web Presence	10	.4	.516	0	1
	Firm age	10	12.9	7.724	5	28
	Multi-chain	10	.8	.422	0	1
	Branches	10	.3	.483	0	1
	Multi-branches	10	0	0	0	0
	Sales and Services Revenues*	4	502.829	535.256	12.517	1143.938
	Total Production*	4	565.099	531.018	113.222	1173.705
	Net income*	4	16.164	12.907	3.042	29.746
Cheese supply chain	Web Presence	7	.429	.535	0	1
	Firm age	7	15.286	9.725	3	26
	Multi-chain	7	.429	.535	0	1
	Branches	7	.286	.488	0	1
	Multi-branches	7	.286	.488	0	1
	Sales and Services Revenues*	3	999.792	913.014	1.826	1793.124
	Total Production*	4	843.743	860.461	3.529	1820.117
	Net income*	3	31.565	60.916	-6.922	101.798
Prickly pear and prickly pear products supply chain	Web Presence	7	.286	.488	0	1
	Firm age	7	10.571	6.554	3	20
	Multi-chain	7	.429	.535	0	1
	Branches	7	0	0	0	0
	Multi-branches	7	0	0	0	0
	Sales and Services Revenues*	4	3068.46	4864.798	.246	10223.107
	Total Production*	4	3166	5019.901	.264	10548.795
	Net income*	4	-6.958	64.215	-90.866	65.583
Exotic fruit and derivates products supply chain	Web Presence	5	.2	.447	0	1
	Firm age	5	20	21.272	4	57
	Multi-chain	5	.6	.548	0	1
	Branches	5	.2	.447	0	1
	Multi-branches	5	0	0	0	0
	Sales and Services Revenues*	1	278.662	.	278.662	278.662
	Total Production*	3	245.105	66.867	206	322.314
	Net income*	1	21.16	.	21.16	21.16

Notes. *Average value computed between 2017 and 2020.

Tab. 3. Characteristics of supply chains

Supply chain	Firm age			Firm size*			Multi-chain		With branches			Total
	0-5	6-24	25+	0-9	10-49	50+	No	Yes	No	Yes	Multi-branch	
Extra Virgin Olive oil supply chain	27	32	3	54	8	0	19	43	51	11	4	62
Wheat and derivates supply chain	14	33	8	49	6	0	25	30	49	6	2	55
Dried fruit and derivates products supply chain	15	13	0	24	4	0	8	20	25	3	1	28
Pulses, hemp, aromatic-officinal plants and their products and honey supply chain	5	14	4	19	4	0	2	21	18	5	1	23
Citrus fruit and citrus fruit products supply chain	4	12	3	18	1	0	5	14	15	4	1	19
Vegetables and their products supply chain	5	12	2	18	1	0	9	10	13	6	2	19
Livestock supply chain	3	5	4	11	1	0	9	3	10	2	1	12
Grape and grape products supply chain	3	6	1	9	1	0	2	8	7	3	0	10
Cheese supply chain	2	3	2	7	0	0	4	3	5	2	2	7
Prickly pear and prickly pear products supply chain	2	5	0	5	2	0	4	3	7	0	0	7
Exotic fruit and derivates products supply chain	1	3	1	5	0	0	2	3	4	1	0	5

Notes. *Average value computed between 2017 and 2020.

Only for those companies for which information could be found through Orbis.

Tab. 4. Current management and control bodies

	Sex		Age			Total
	Women	Men	18-25	26-50	50+	
CEO	48	112	9	90	61	160
Board of Directors	14	47	5	32	24	61
Board of Auditors	4	9	0	6	7	13
Judicial Administrator	0	1	0	0	1	1
Partner	6	2	1	2	5	8
Other	0	3	0	0	3	3

Tab. 5. Key informants

Key informant ID	Job position	Type of company and Supply chain	Interview duration (in minutes)
KI-1	Project Leader	/	90''
KI-2	Spokesperson for the regional policymakers	/	60''
KI-3	Certification agency's Project Manager	/	30''
KI-4	Sales Manager	Farm and Processor - Pulses, hemp, aromatic-officinal plants and their products and honey supply chain Livestock farms, processors, and packers - Livestock supply chain	20''
KI-5	Founder and Legal Representative	Farm and Processor - Cheese supply chain	25''
KI-6	Founder and Company Partner	Farm and Processor - Citrus fruit and citrus fruit products supply chain Processor and Packager - Wheat and derivatives supply chain Farm - Extra virgin olive oil supply chain	40''
KI-7	Quality Manager	Processors and Packagers - Vegetables and their products supply chain	30''
KI-8	Quality Manager	Mill and Processor -Wheat and derivatives supply chain	20''
KI-9	Founder	Farm - Citrus fruit and citrus fruit products supply chain Farm - Extra virgin olive oil supply chain	50''
KI-10	Owner and Legal Representative	Farm - Prickly pear and prickly pear products supply chain, Dried fruit and derivatives products supply chain, Pulses, hemp, aromatic-officinal plants and their products and honey supply chain, Extra virgin olive oil supply chain, Vegetables and their products supply chain, Grape and grape products supply chain	60''
KI-11	Administrator	Mill and Processor -Wheat and derivatives supply chain	20''
KI-12	Owner	Processor and packager - Citrus fruit and citrus fruit products supply chain, Cheese supply chain, Dried fruit and derivatives products supply chain, Wheat and derivatives supply chain	20''
KI-13	Administrator	Oil mill and packer - Extra virgin olive oil supply chain	40''
KI-14	Owner	Farm - Dried fruit and derivatives products supply chain, Extra virgin olive oil supply chain, Wheat and derivatives supply chain	35''
KI-15	Owner	Farm - Extra virgin olive oil supply chain	25''
KI-16	Owner	Farm - Wheat and derivatives supply chain	30''
KI-17	Administrator	Farm, Processor and Packer - Vegetables and their products supply chain	40''
KI-18	Owner	Farm - Dried fruit and derivatives products supply chain	55''
KI-19	Owner	Farm - Exotic fruit and derivatives products supply chain	30''
KI-20	Owner	Farm - Extra virgin olive oil supply chain Farm and Processor - Grape and grape products supply chain	40''
KI-21	Owner	Processor and Packer - Wheat and derivatives supply chain	40''
KI-22	Owner	Farm - Wheat and derivatives supply chain	20''

Tab. 6. Summary of secondary data sources

Source	Type
Archive documents	Renewal of UNI EN ISO 22005:2008 certificate and start of digitization project Executive plan of project activities
Project kick-off meeting	Transcript of the kick-off meeting held on 14 February 2022
Official project website	Web Page

Sustainable business model innovation for local development: the role of knowledge management

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Abstract

Framing of the research. *The article analyses the concepts of BMI and sustainability, identifying a gap: the business model applications, its evolution and approach to sustainability were discussed, but the role of knowledge management in their implementation and how big data analysis may influence them isn't explored (Ferlito R. et al. 2022).*

Purpose of the paper. *Rediscovering its local roots and environmental sustainability, the document aims to analyze the sustainable business model innovation (SBMI) and understand its impact on the environment. Furthermore, it examines how knowledge management supports the integration of sustainability into the business model, fostering innovation. Consequently, the research outlines the ways that the company undertakes to adopt a sustainable innovation process, evaluating the availability of knowledge and identifying information management strategies useful for the development of the SBMI.*

Methodology. *The Case Study is used for a Campania company, with a content analysis. This region has been selected because the intent is to search in local roots an identity heritage to enhance.*

Results. *Results illustrate how good knowledge management impacts on the identification of the business model, on organizational performance and on the company's sustainable competitive advantage.*

Managerial implications. *A company that designs SBMI integrating KM systems and Big Data increases its strategic value. Practical and managerial implications are foreseen, supporting management in corporate reorganization to face innovative challenges, respect the guidelines for local sustainable development and strengthen the link with one's homeland.*

Originality of the paper. *Management is advised to strategically and systematically integrate SBMI, knowledge management and Big Data to pursue sustainable commitment objectives.*

Key words: *Innovation, Business Model, Sustainable business model innovation, Knowledge Management, Big Data, Data-Driven Decision Making.*

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1. Introduction

In the current socio-economic context it is essential - for companies that intend to bring benefits to the local context - to analyze the sustainable business model innovation (SBMI) as a construct capable of respecting the principles of sustainability and innovation.

The article focuses on issues related to BMI and sustainability, starting from the assumption that the business model (BM) can be understood as the result of organizational change processes that identify and describe innovative strategies and knowledge sharing for designing businesses sustainable. In fact, in defining the business model, to date, companies must take into account the criteria of sustainability, innovation and the preferences of citizens since the business model concerns the way in which a product or technology is marketed and, therefore, how the company creates value. Sustainability, on the other hand, means the ability to satisfy current needs without compromising the possibility of future generations to satisfy their own needs (Brundtland Report, 1987), i.e. an integrated approach that aims to balance the environmental, social and economic aspects of decisions and actions. In this process, knowledge assumes importance, understood as the company's ability to absorb and integrate resources and skills (Scuotto *et al.*, 2017); the cooperation between knowledge management and business model ensures new forms of co-value creation focused on innovative and sustainable services (Troisi *et al.*, 2018), able to determine the competitive advantage of society. Therefore, to date, sustainability influences how companies design their business model in their local roots, integrating environmental and social objectives to create sustainable value for their community. Sustainability considerations guide business decisions in adopting practices that are cost-effective, socially responsible, and environmentally sustainable. In detail, sustainability influences the design of the business model at the local level in terms of:

- identification of local needs: sustainable companies take into account the specific needs and characteristics of the local context in which they operate. This implies an in-depth understanding of local community needs, available resources and social and economic dynamics;
- use of local resources: sustainable companies seek to make the most of available local resources. This can include adopting sustainable sourcing practices, using local raw materials, engaging local communities in the value chain, and developing partnerships with local suppliers and stakeholders. This not only reduces the environmental impact associated with resource transportation, but also contributes to the socio-economic development of local communities;
- involvement of local stakeholders: sustainability requires the active involvement of local stakeholders, such as communities, local authorities and non-profit organisations. Sustainable companies seek to understand and respond to the needs and expectations of these local stakeholders, involving them in decision-making and promoting collaboration to address environmental and social challenges. This translates into a more inclusive business model that is responsive to local needs;
- positive impact on the local community: sustainable companies seek to generate a positive impact on the local community in which they operate. This can be done through the creation of local jobs, developing the skills and abilities of local people, investing in community development projects and promoting social and cultural initiatives. The aim is to create a positive link between the company and the local community, contributing to local well-being and prosperity.

In these dynamics, knowledge management plays a fundamental role in ensuring that the company has access to the knowledge necessary to adopt sustainable decisions and strategies: the interconnection of these concepts allows companies to align their activities with sustainability and to promote innovation for a more sustainable future.

The digital transformation and the connected need to define an adequate strategy for the social system, in fact, represents the new paradigm in the business world (and not only) as there is the expectation that companies respond adequately to social and environmental problems ; it is no coincidence that we speak of digital transformation, i.e. actions capable of seizing various opportunities from the exchange of knowledge, identifying organizational strategies capable of

providing services based on smart technologies (Troisi *et al.*, 2022). More and more management scholars, in fact, frame innovation and sustainability as fundamental elements in the development of the business model, together with social behaviors and user experiences (Fellenstein and Umaganthan, 2019). Despite the importance and benefits deriving from this model, the following research highlights a gap existing in the literature regarding the (local and organizational) potential of SBMI; therefore, the research aims to identify the capacity and influence of SBMI in increasing corporate competitiveness and ensuring local development, as well as to identify the role of knowledge in this process through the methodology of content analysis. This research plays a vital role in promoting the adoption of sustainable practices and in business innovation for a more sustainable future, by identifying the benefits, challenges and opportunities arising from the integration of BMI, sustainability and knowledge management. This can help business decision makers make informed decisions and develop effective strategies for adopting sustainable practices and fostering innovation.

This study is structured as follows: in the theoretical background, a brief overview of the key concepts of business model, business model innovation and sustainability is presented, with an attached focus on knowledge and its value; subsequently the methodology used is illustrated and the company case study is presented and, finally, the results revealing the knowledge management strategies useful for the development of SBMI are illustrated.

The document represents an important novelty in its sector, as it highlights the synergistic effects between SBMI and knowledge management on company performance and on the reference territory. This research contributes to broadening knowledge and awareness regarding the role of knowledge in adopting an SBMI to promote local development. In particular, it is highlighted that knowledge management plays an essential role in the development of an innovative and sustainable business model and that it can be supported by an efficient data analysis capability.

2. Theoretical Background

2.1 Sustainable Business Model Innovation

2.1.1 Business Model Innovation

The business model (BM) concept emerged at the end of the 20th century, years of globalization and digital progress which led to a diversification of demand and an unceasing need for companies to respond effectively to changes in the environment, events which lead to a rethinking the asset and corporate strategy. Indeed, according to Peter Drucker, today the competition is between business models (Aagaard and Lindgren, 2015).

The BM illustrates the logic according to which a company creates, distributes and captures value (Osterwalder and Pigneur, 2010). Timmer (1998), in fact, describes the BM as a representation of the potential benefits for corporate actors, whereas Chesbrough and Rosenbloom (2002) and Magretta (2002) connect it to strategy and innovation. Similarly, Richardsson (2008) believes that the business model is the link between corporate strategy and related activities and, similarly, Casadesus-Masanell and Ricart (2010) state that it reflects the strategy implemented by the firm.

In particular, Teece (2010) provides a clear definition of the business model, outlining the architecture of value creation, delivery and acquisition mechanisms; in addition to this, it identifies the strategic, customer and market components to ensure the achievement of the competitive advantage in a dynamic context (Wirtz *et al.*, 2016).

BM, therefore, can be illustrated as a unique representation of the proposition, creation and delivery of value and the elements of value capture, as well as the interactions between them in a company.

In the last decade, however, the literature concerning the business model has moved away from the belief that innovation takes place only through a product or a process, focusing - thus - on the transformation of the business model, i.e. on the possibility of auxiliary of a new way of “doing business” through a suitable means to extend the ability of companies to act effectively and efficiently (Ludeke-Freund *et al.* 2019). This is because the changes deriving from new technologies can have a positive impact on company performance and management must be able to recognize and manage the opportunities as well as the threats deriving from the market.

Business model transformation has been triggered by factors such as sustainability, artificial intelligence, deep learning and big data which, in turn, have increased the need for companies to innovate and change their business (Minatogawa *et al.*, 2020). Not surprisingly, Geissdoerfer *et al.* (2017) believe that business model innovation is part of the corporate strategy and can increase the company’s resilience and its chances of success (Geissdoerfer *et al.*, 2018). Therefore, Business Model Innovation (BMI) consists of the company’s ability to operate according to innovative methods (Amit and Zott, 2020) and, more specifically, some researchers have used Business Model Innovation as a strategic analysis tool (Lantano, Petruzzelli and Panniello, 2022).

In managerial studies there are different definitions of BMI, among the most relevant we identify the thought of Teece (2018) who describes it as a tool for innovation suitable for improving company performance in a troublesome business environment and, in order to pursue a competitive advantage, it’s necessary to configure a dynamic BMI, changing business operations for continuous improvement. Foss and Saebi (2017) believe that BMI implies the investigation of new business logics and the design of innovative phases to generate and acquire value for the players in the system. Other authors, however, believe that business model innovation affects the entire firm (Zhang *et al.*, 2018) as it can improve its competitiveness. In fact, literature has shown that the main effect of Business Model Innovation is constant performance, to then proceed with the achievement of the competitive advantage thus differentiating itself from competitors because the BMI itself is seen as a source of innovation (Bashir and Verma, 2019).

Therefore, nowadays, to compete in the global market, companies must constantly adapt, reorganize and redefine their business (Geldres-Weiss *et al.*, 2021); not surprisingly, the essence of BMI is the change in the corporate structure for the proposal, creation, delivery and acquisition of value (Geissdoerfer *et al.*, 2018) by enhancing the adaptation for vital environments.

Briefly, the BMI can be understood as the result of organizational change processes that identify and describe innovative strategies for designing sustainable business models.

2.1.2 Business Model Innovation and sustainability

Digital transformation and the related need to define an appropriate strategy for the social system represents the new paradigm in the business world and beyond: companies are increasingly forced to rethink their way of “doing business” due to the challenge of achieving of sustainability in business practices (Romero *et al.*, 2021), the introduction of technological opportunities and changes in customers’ lifestyles and preferences (Jørgensen and Pedersen, 2018). In fact, more and more management researchers frame not only innovation, but also sustainability as fundamental items in the development of the business model, together with social behaviours and user experiences (Fellenstein and Umaganthan, 2019). Therefore, in recent years, a new form of BMI has occurred by incorporating the concept of sustainability into company objectives and processes, thereby introducing the notion of Sustainable Business Model Innovation (SBMI). BMI and sustainability are closely connected as both aim to address the current market challenges, integrating innovation and the balance between the economic, social and environmental aspects of business activities. BMI represents a new and strategic perspective for designing business models that generate value through innovation. On the other hand, sustainability requires the adoption of responsible practices that take into account the needs of present and future generations, promoting the sustainable management of resources and social equity. Together, BMI and sustainability offer

an integrated approach to developing business models that address global challenges and create a sustainable future.

So, sustainable business model innovation (SBMI) can be translated as the change in company procedures that have a positive impact on the environment, since the conduct of citizens and knowledge influence the company's social commitment and knowledge management represents both a competitive advantage than a challenge for local development. Therefore, nowadays companies are expected to strive towards sustainable development (Szromek, 2021), responding adequately to social and environmental issues, as well as to the economic expectations of their shareholders (Aluchna and Rok, 2018) since, initially, the introduction of the SBMI was aimed at putting companies at the service of the transformation towards a more sustainable system (Wells, 2013), while, today, this notion is considered a source of competitive advantage (Porter and Kramer, 2011).

Sustainability, however, hasn't received attention only in recent years: in 1987, the Brundtland Report introduced the notion of sustainable development, according to which the satisfaction of the needs of current generations mustn't compromise the possibility of satisfying the needs of future generations (WCED 1987).

Due to this increased focus on social and environmental sustainability, many companies and management searchers have become interested in implementing an SMBI; in fact, there is a broad overview of sustainable BMI theories: according to Garetti and Taisch (2012) sustainable innovation business models have a global market perspective and consider the development of the new industrialized countries and the need to circulate more sustainable value propositions; while, Schaltegger *et al.* (2012) believe that these business models create customer and societal value by integrating technological, social, environmental, and business activities. Boons and Lüdeke-Freund (2013) state that SBMI can be interpreted as overcoming corporate barriers and the associated environment to commercialize sustainable process, product or service innovations. Lastly, Abdelkafi and Tauscher, (2016) and Evans *et al.* (2017) believe that sustainable business model innovations incorporate innovation and sustainability as an integral part of the firm's value proposition and value creation rationale. Thus, they provide value to the customer, the natural environment and society.

So, this new construct intends to strengthen the company's ability to integrate sustainability into its business processes, addressing the challenges related to sustainable development while creating a sustainable competitive advantage (Geldres-Weiss *et al.*, 2021) and benefits for the environment and society (Presenza *et al.*, 2019).

In this first extract it can be seen how the scientific literature has recognized the importance of the sustainable business model (SBMI) and its effects on the company and on the reference territory. However, there is still a significant knowledge gap and in-depth understanding of the specific impacts an SBMI can have on businesses and how it can be a support tool for local businesses.

First, existing studies often focus on defining and theorizing the concept of SBMI, providing a conceptual framework and an overview of its characteristics. However, this leaves a dearth of empirical research exploring the concrete effects of adopting an SBMI on business performance, competitiveness and resilience.

Second, the literature offers only a limited understanding of how an SBMI can be a valuable support tool for local businesses. Research tends to focus on the general impacts of SBMI at a global or sectoral level, often neglecting the specific dynamics of local firms. This includes the lack of studies investigating how an SBMI can influence the connection and integration of businesses with the local community, available resources and territorial specificities.

Furthermore, further studies on implementation strategies and critical success factors in the adoption of an SBMI by local enterprises are needed. This includes assessing the specific challenges and opportunities local businesses may encounter in the process of transitioning to an SBMI, as well as identifying the most effective best practices and change management models.

Therefore, we intend to investigate:

- RQ1: How does the SBMI impact the company to increase its competitiveness?

Furthermore, since it was highlighted in the reading that the conduct of citizens and knowledge influence the social commitment of the company, the intention is to analyse how greater attention to the social and environmental sustainability of a company, in the development of an innovative business model can affect the community. Therefore, the study seeks to address the following research question:

- RQ2: What influence does the SBMI have on local development?

2.2 Knowledge Management: Driving Innovation in Sustainable Business Models

Innovation and technology play a fundamental role in supporting the transition towards a sustainable business model, enabling companies to create economic, social and environmental value in an integrated way. Through the use of digital technologies, such as online platforms, the circular economy and access-based service models, companies can promote the sharing of resources, the reduction of waste and the creation of shared value. Technology can play a fundamental role in supporting sustainability in corporate activities, allowing to reduce environmental impact, improve resource efficiency and promote social responsibility and, therefore, facilitating the adoption of innovative and sustainable business models.

Nowadays, it's essential for companies to be innovative and to be so, they must focus on the development of a knowledge transfer process - an important intangible resource - which represents the main factor of business success (Del Giudice *et al.*, 2017a); in fact, a business process with a high knowledge intensity is strongly characterized by dynamic changes inherent in the training environment and in the communication and collaboration patterns between the members of the company (Papavassiliou and Mentzas, 2003). It's useful to remember that innovation is a multilevel framework that requires multiscale inputs to emerge (Troisi and Grimaldi, 2022): a multidimensional process such as the development of innovation requires an integration of human and social knowledge.

In this regard, according to Davenport and Prusak (2000), knowledge resides in the human mind, involves experience, reflection, judgment and includes intuitions based on past experiences and expectations (Wiig, 2011), making it the resource more strategic for management (Kostova and Roth, 2003).

When we talk about knowledge and knowledge management, we are referring to the process of acquiring, converting, disseminating, applying and reusing knowledge in a company. Over the years, companies have shown more and more interest in implementing knowledge management processes and technologies, adopting knowledge management as part of the corporate strategy.

Goel *et al.* (2010) define KM as a set of procedures designed to enhance the learning, sharing and decision-making process of a company and, consistently, Bashir and Farooq (2019) illustrate KM as a framework aimed at learning, sharing and codification of knowledge useful for the creation of value and for the definition of a coordination mechanism that transforms data and knowledge into value propositions. In fact, companies develop KM systems starting from the assumption that the result will be an expansion of effectiveness, efficiency and competitiveness (Farzin *et al.*, 2014). Meso and Smith (2000), on the other hand, define knowledge management as that process of acquiring and using skills and intelligence within a company to promote innovation through continuous learning.

The emergence of 4.0 technologies has led to a growing adoption of intelligent devices which have implied a growing production of data of different nature and deriving from different sources. In fact, currently, users - unknowingly - generate, globally, a considerable amount of data following the use of social and networking platforms and, in this regard, it's appropriate to introduce the concept of big data and how it has changed the way to "do business". While, initially, the attention of researchers focused on the volume and growth in the size of data, recently there has been an increasing emphasis on methods of analysis effective enough to produce significant improvements

in the system. Big Data Analytics (BDA) is described as the way in which the big data analysis process takes place. Indeed, in recent years, the process and practices of knowledge have undergone a revolution since companies create, share and acquire big data, which - if properly managed - become a valuable resource of knowledge (Erickson and Rothberg, 2014) since “smart technologies” and the digitization of business processes can foster the development of innovation (Visvizi A. *et al.*, 2021) and implement, as well as improve, a big data knowledge management system. Not surprisingly, the development of a good sustainable business innovation model depends on knowledge management and big data analysis skills, since the use of these data favours the acquisition and exchange of knowledge between management and the environment (Scuotto *et al.*, 2017).

In detail, the delineation, transformation and implementation of the business model is a business innovation method whose essence is the creation of new knowledge (Scuotto *et al.*, 2017) and without it would be difficult for companies to develop an optimal and efficient business model. In fact, according to Mokhtarzadeh *et al.* (2021), innovation allows companies to acquire valuable forms of knowledge to increase performance and innovate their business models: to create a profitable business model, management should identify the need to disseminate knowledge to all management levels thus obtaining a sustainable competitive advantage. Nielsen (2018), on the other hand, has highlighted a close interconnection between BMI and KM, stating that the improvement of knowledge management practices creates improvements in business model innovation.

In this sense, knowledge management practices affect business model transformation (Li *et al.*, 2021). In particular, knowledge management and the implementation of an SBMI can improve the competitiveness and trust of all players in the business system, fostering innovation and sustainable growth, since knowledge based SBMI facilitates new value propositions, significantly determining the competitive advantages of companies.

In order to redesign sustainable business models using new technologies, it's necessary that the strategic management of data stimulates the improvement of decision-making processes: specifically, the data-based decision-making process (DDDM) reformulates and rethinks managerial practices, considering data as the driver of decision-making process in order to cope with the complexity of the market system; therefore, the DDDM supports the redefinition of innovation management in a social and integrated system (Troisi O. *et al.*, 2019), embracing three aspects: technology dimension, human dimension and managerial dimension.

Indeed, today, big data is the cornerstone in the generation of new business models: Corrales-Garay *et al.* (2020) found that big data analytical skills, innovation and business models are essential items in the analysis of entrepreneurship. In fact, the most advanced KM systems use big data in corporate strategies to enhance and improve management decision-making through the predictive ability of data analysis (Intezari and Gressel, 2017). By doing so, companies can lead their business towards objectives and models that are not only innovative, but also sustainable, consequently increasing their reputation and social responsibility towards their community.

Therefore, on the assumption that the knowledge management process is essential and primary for a company and that knowledge is a central resource (Friedrich *et al.*, 2020), it becomes interesting to understand how this KM process, driven by digital innovation, can guide the company's strategy towards innovative sustainable business models and create value for the community.

Thus, this study seeks to fill the gap in the literature, trying to answer the following research questions:

- RQ3: What is the role of knowledge management in implementing an SBMI?
- RQ4: How can big data analytics influence the knowledge creation and management process in developing an SBMI?

3. Methodology

With the intention of filling the gap in the literature and answering the previous research questions, this study uses the case study methodology, whose protagonist is the Sada Group, a century-old company and industrial group specialized in the production of packaging in primary and secondary, consisting of seven plants distributed throughout the country and connected at Italian and European level with important industrial companies in the sector through joint ventures and commercial agreements. The choice of this group is not accidental, it - in fact - was selected as a case study because it fully embraces the principles of sustainability and innovation and has a high focus on local development.

As a sustainable business model, Sada Group can be considered an excellent case study for several reasons:

- commitment to sustainability: Sada Group demonstrates a strong commitment to sustainability through its corporate vision, policies and practices. It has integrated sustainability into its corporate DNA, adopting concrete strategies and actions to reduce environmental impact, promote social equity and ensure economic profitability;
- sustainable innovation: Sada Group has demonstrated a capacity for sustainable innovation in its business model. It has introduced new technologies, processes and products that contribute to environmental and social sustainability. This demonstrates a willingness to adapt and adopt innovative solutions to address environmental and economic challenges;
- responsible management of resources: Sada Group undertakes to responsibly manage natural resources, reducing the use of energy, water and non-renewable materials. It has implemented energy efficiency practices, waste recycling and the use of renewable energy sources, contributing to the conservation of resources and the mitigation of climate change;
- stakeholder engagement: Sada Group has established strong relationships with stakeholders, including employees, suppliers, customers and local communities. It promotes the active involvement of the parties involved in defining sustainable strategies and in sharing the benefits generated by its activities;
- transparency and accountability: Sada Group adopts practices of transparency and accountability, communicating its sustainable performance in a clear and accessible way. It reports on its objectives, actions and results, allowing all stakeholders to evaluate and verify its commitment and progress towards sustainability.

These combined elements make the Sada Group a successful case study in promoting sustainability through its business model. Its commitment, its innovation and its responsible management of resources that offer important lessons and best practices for other companies that require sustainability as an integral part of their activities.

Through a qualitative-exploratory analysis, the study is conducted through the technique of content analysis, whose objective is to analyse the information content of textual data (Mayring, 2000); in particular, with it the data are categorized using categories that are generated both inductively and through a close reading (Morgan, 1993), to then enrich and revise the variables of the study.

Content analysis is a systematic and replicable technique used to compress many words of text into content categories based on explicit coding rules (Berelson, 1952; GAO, 1996; Krippendorff, 1980; Weber, 1990), allowing researchers to find out and describe the interviewee. For content analysis to be effective, according to Gutri *et al.* (2014) the classification categories, i.e. the units of analysis, must be defined.; data acquisition must be systematic and characteristics of reliability and validity must be present.

3.1 The case: Sada Group

Sada Group - a century-old company with a turnover of 145 million euros and which employs over 550 people - is an industrial group specialized in the production of packaging in primary and

secondary cellulosic materials, made up of seven plants distributed throughout the country, connected at the Italian and European level with important industrial companies in the sector through joint ventures and commercial agreements. It includes Flexo, Offset and Digital technologies in the production process and sustainability represents a fundamental value, a transversal element that guides all the activities it carries out. The Group is aware of the importance of safeguarding the environment and undertakes to ensure that all activities do not negatively affect the natural balance: it considers sustainability a strategic factor and an engine that drives present and future activities, promotes and spokesperson for the circular economy.

In the last twenty years, the Group has experienced an important development in terms of volumes, turnover as well as process and product innovation. Important investments of the latest generation have been made in terms of machinery, plants, IT systems, upgrades, important acquisitions which have led to the growth of the Group. The continuous improvement process that has always distinguished the Group is constantly pursued. Furthermore, the Group has an integrated quality, environment, ethics and hygiene certification system and the same quality is the leitmotif that runs through the entire production process.

3.2 Data collection and analysis

Data collection and analysis took place during the second week of February 2023 and, in line with the research objective and with the constructs identified in the literature, an exploratory approach was used by grouping the primary data through an interview with Valentina Sada (Sada Group Marketing and Communication Manager and Cart-One) and secondary data from official documents prepared by the manager himself, in particular the social report and the code of ethics.

The research was based on the Gioia methodology, also known as narrative analysis, to analyze the narrative texts deriving from the interview via Teams with Valentina Sada and from the aforementioned documents provided by the company. This methodological choice was motivated by the belief that narratives can reveal deep meanings and insights, offering a perspective on individual and collective experiences. The main objective of the research was to explore and interpret the meanings constructed within the narratives, in order to obtain a more complete understanding of the examined phenomena.

The study design starts and derives from the research questions and, by adopting a qualitative-exploratory approach based on the analysis of the contents, the macro-variables of the study are obtained from the existing literature: Business Model Innovation & Sustainability (Wells, 2013 ; Geldres -Weiss *et al.*, 2021; Szromek, 2021) and KM for SBMI (Meso and Smith, 2000; Kostova and Roth, 2003; Scuotto *et al.*, 2017; Mokhtarzadeh *et al.*, 2021) with their key dimensions. These were subsequently divided into sub-dimensions and, more precisely:

- the Business Model Innovation & Sustainability construct has been broken down into technological, organizational and social variables (Schaltegger *et al.*, 2012);
- the KM construct for SBMI, on the other hand, has been divided into Knowledge (Nielsen, 2018) and Big Data (Intezari and Gressel, 2017).

Therefore, focusing on the research questions, the study aims to understand how SBMI can have a positive impact on company competitiveness (RQ1); understand how the adoption of an SBMI influences the development of the local context (RQ2); investigate the role of knowledge in the development of an SBMI (RQ3) and, finally, understand how big data analytics influence the knowledge creation and management process in the development of an SBMI (RQ4). From this it can be deduced that for each research question the variables useful for drafting the questions administered during the interview were specified (Table 1).

The intent is therefore to illustrate the paths that the company can take in adopting a sustainable innovation process, verifying the availability of knowledge and identifying the knowledge management strategies useful for the development of the SBMI.

Tab. 1: Interview constructs and structure

BUSINESS MODEL INNOVATION & SUSTAINABILITY	
Business Model	<p>What is the business model used by your company? What are the benefits of it? What are the core activities? Does your organization's business model include sustainability principles, artificial intelligence, deep learning, and big data? Do you believe that your organization's actions have a direct impact on your society? In your opinion, in developing its local roots, has your organization created/can create a link between innovation, sustainability and corporate competitiveness? If yes, why? In your opinion, if your organization adopted an SBMI would it be able to increase the local development of the Campania Region? If yes, why? In your opinion, what are the main elements of the SBMI that increase the competitiveness of your organization?</p>
Technological innovation	Is your organization's business model capable of creating an adaptation between the characteristics of the technology and new commercialization approaches?
Organizational innovation	Has business model innovation towards approaches to sustainability changed your way of doing business?
Social Innovation	In your opinion, is it important to implement a sustainable business model that allows you to create social value and maximize social profit?
Sustainability	<p>In your opinion, can business models lead to sustainable innovations and can this be related to business success? Can your organization's business model serve as a vehicle for coordinating technological and social innovations with sustainability? Does your organization's business model maximize social and environmental benefits?</p>
KM FOR SBMI	
Knowledge	<p>In your company, is the knowledge management process part of the corporate strategy? Is your company characterized by dynamic changes inherent in the learning environment and patterns of communication and collaboration between organizational members? Does your organization's system provide fulfilling work experiences and enhance knowledge creation and sharing? In your opinion, knowing how to manage and share knowledge is fundamental in the implementation of an SBMI? If yes, why? According to you, the relationship between SBMI and KM creates improvements for the community? In your opinion, does the creation and diffusion of knowledge have a positive effect on the development of territorial relationships? Does your organization have relationships with local actors? Is there an exchange of knowledge and value with them? How much do they affect the organization's performance?</p>
Big data	<p>Is your organization's decision-making process data-driven? In the process of transferring knowledge within your organization, do you also refer to information deriving from big data? If yes, how critical is the ability to analyze big data? How does your company use data analytics to support decision making? Do you think that data analysis can contribute to the development of SBMI?</p>

Our elaboration.

The texts were explored through a process of semantic interpretation. The investigated variables were divided into keywords to facilitate the search for topics and sub-themes within the text. In detail, to understand how the SBMI can positively impact company competitiveness (RQ1) and understand how its adoption affects local development (RQ2), the following sub-dimensions were used: business model, technological, organizational and social variables ; while, to investigate the role of knowledge in the development of an SBMI (RQ3) and to understand how the analysis of big data influences the knowledge creation and management process in the development of an SBMI (RQ4), sub-dimensions related to knowledge were used and big data.

4. Results

4.1 The SBMI as a key factor to increase the company's competitiveness

4.1.1 Business Model Innovation & Sustainability

Business Model

The business model of the Sada Group intends to guarantee continuity and quality of supplies to customers, remodelling - when necessary - the supply chain which has also involved new markets; at the same time, the company works with its partners to contain the consequences of the volatility of the energy markets and manage medium and long-term risks. In fact, the Group «supports and ensures a very wide range of production to its customers» ranging from corrugated cardboard to paper converting (in particular, primary and secondary packaging) with advanced and always new generation technologies since the Group fully embraces digital innovation, an important element for it to be competitive on the market.

Competitiveness, in fact, represents one of the main advantages of the organization which originates through the provision of diversified activities: starting from the packaging activity and arriving at a research and development activity which has allowed the company to have always adopted a proactive approach towards the market, an approach that has allowed the company to achieve the sustainability objectives envisaged by the 2030 Agenda in a well-limited period of time (in line with what is specified by the Paris agreement of 2015 and the indications of the United Nations SDGs) and, not surprisingly, sustainability - together with technologies - represents a strategic factor in daily business activities, capable of triggering continuous improvement. Another essential activity is consultancy provided to customers, as well as customer service and after-sales assistance. «All these elements make the Sada Group the market leader that thinks up and implements innovative sustainable projects knowing the impacts of its production thanks to a very long, expensive and costly life-cycle assessment (LCA)» which, however, allows you to know better critical impacts along its supply-chain, improve processes and communicate the results of its commitment to the sustainable development of its products and activities.

The life cycle assessment studies have the purpose of identifying the potential environmental impacts associated with the total production, both in corrugated, flat cardboard and microwave, to verify any opportunities for improving environmental performance. Over 90% of the raw materials come from FSC® certified sources and other controlled sources while the company's work continues to introduce increasingly renewable and responsibly managed materials into the supply chain.

Technological innovation

As already mentioned, technology is a fundamental factor in the company process through which, over the years, improvements have been made in compliance with the Key Performance Indicators (KPI), in terms of water savings, emissions and process efficiency. The reporting and monitoring process of relevant KPIs for sustainability involves the Parent Company as regards cross-cutting issues and all the companies included in the Group's scope of consolidation.

«Digital innovation has changed the Sada Group's way of doing business», paying attention - at the same time - to the fight against waste, improvement and, even more, to sustainability which has always been the basis of the company's business idea.

Consistent with the above, Sada packaging is designed according to the most advanced principles of eco-design, considering their impact throughout the entire life cycle. The R&D Department collaborates with customers, suppliers, research centres and universities to develop innovative and sustainable solutions, from materials to the development of new machinery for pilot projects. Furthermore, in 2021, the Sada Group consolidated its investment in technologies related to the control and reliability of the industrial process. In particular, the process of changing management software has begun through the progressive adoption of MES and ERP.

Organizational innovation

Sustainability has always been the basis of the Sada Group's business idea; therefore, the company has always been oriented towards an innovative and sustainable business model. Certainly, over the years, there has been an evolution, providing for an improvement in compliance with the KPIs, thus changing the way of working. In fact, «the company annually presents a Sustainability Report» which provides a detailed description of the economic, environmental, social, financial and digital performances of the companies referable to the Group's production facilities in order to transparently report and disclose performance, policies, objectives and results of its model of sustainable development. This shows how the company cares about the protection of the planet and the conservation of its natural resources for future generations and - adopting an SBMI model - manages to recognize the impact that its activities can have on the environment, having among its corporate priorities is the reduction of the carbon footprint per ton of product. In designing and implementing the business model, the Group's management is aware of the challenges associated with sustainable development and recognizes them as an opportunity to continuously innovate and improve the design of its products and the organization of its operating methods. This commitment has led to a re-evaluation of every element of the company, from packaging design to production, from logistics to procurement. Through the improvement of good environmental practices, the Group is strengthened as a whole, with more efficient processes and greater attention to innovation.

Social Innovation

Implementing a sustainable business model allows the Sada Group to create social value and maximize social profit: since 2016 the main companies of the Group have been certified according to the SA8000 standard which constitutes an international recognition of corporate social responsibility and commitment to compliance with the rules of work ethics and adequate working conditions. «Presenting a workforce of 550 employees, the company considers the well-being and growth of its collaborators essential, so that they identify with the company's values, becoming its main ambassadors, as well as leaders capable of driving change and innovation».

Company activities are conducted with ethics and integrity towards customers, employees and suppliers, an approach that has been a cornerstone of corporate culture since 1870 and an essential ingredient for future successes. This *modus operandi* has a positive impact on society, thanks to numerous company initiatives aimed at favouring the balance of private and professional life of each collaborator, such as facilitations for the purchase of goods and services, through agreements with companies operating in other sectors such as, for example, health and well-being but also with nursery schools and playrooms.

Furthermore, the company remuneration policy is based on the CCNL applied but also on the recognition of merit and commitment, both collectively and individually, and provides for attendance and performance bonuses, agreed with the trade union representatives, which can be converted into products and services aimed at support workers and their families in social and cultural activities, in training development, in school expenses; performance bonuses for management in relation to results but also to the adoption of good practices aimed at reducing consumption and waste; the rigorous application of the equal opportunities code and the absolute prohibition of discriminatory pay practices; the containment of pay differences between the highest and lowest levels; the transparency and fairness of the recruitment process, the turnover rate, the progressiveness and rewarding of the remuneration policies which are the indices that the BoD monitors for the assessment of the quality of human resource management.

Finally, the Research & Development Department collaborates constantly with customers and suppliers to ensure reliability and safety of the packaging, both for its functional and performance characteristics, and to offer easy ways of use that simultaneously protect, especially for packaging containing potentially dangerous products, the weakest and most at risk individuals.

The economic performance of the Group, on the other hand, is expressed through the preparation of the Consolidated Financial Statements which contain the economic-financial results of the

companies belonging to the Folding Carton and Corrugated operating Divisions and the Sada Group considers the stability and constancy in the distribution of profits to shareholders, one of its most important management priorities. At the same time, it considers the creation of its own resources and reserves to be allocated to activities aimed at increasing the value of the company as strategic investments in research and development, innovation and enhancement of human resources as essential.

Sustainability

The Sustainability strategy of the Sada Group and the associated business model acts as a vehicle for coordinating technological and social innovations with sustainability, leading - precisely - to sustainable innovations and guaranteeing corporate success; not surprisingly, the three pillars of the company strategy are: people, product and environment.

Producing sustainable and quality packaging is a challenge that the Group engages daily to guarantee customers and consumers reliable, safe and long-lasting products, in fact, company processes are inherent in technologies that support the entire activity and ideas of the organisation. The increasingly profound knowledge of product control and the continuous dialogue with customers have led the Sada Group Quality Control to introduce statistical concepts to keep the process capability and the structural yielding of the packaging under control.

2021 was a very fruitful year for R&D activities linked to ministerial projects: two ministerial projects were concluded very well, namely the *Barriera* project, the packaging of which had begun in 2017 and involved the development of a new range of products consisting from a microwave cardboard characterized by a structure with highly innovative barrier properties capable of replacing, in some applications, even plastic packaging, considerably reducing the weight of the multilayer and managing to guarantee the performance of current products for the food packaging sector and not the *BioLINE* project which had as its object the study of new plastic materials designed for the creation of innovative products, which are compostable and characterized by specific functional properties, including the high barrier properties to gases, water vapor and oils, thermal stability, food compatibility, environmental safety and operational.

Furthermore, the Sada Group stands out from its competitors for its ability to comply with the rules, thus obtaining certifications that best enhance the organization's commitment and testify to the constant attention to quality and respect for the environment and people. During 2021 all the productions of the Folding Division have been EPD certified and a new LCA study is underway which will also include the *SIFIM* productions for the next EPD of the Corrugated Division. There are several certifications obtained by the Sada Group, among them it is useful to mention: ISO 9001, ISO 14001, ISO 45001, SA 8000 and ECOVADIS. Finally, in 2022, the Group's Corrugated Division was awarded the Gold Medal by Ecovadis, a world leader and one of the most reliable in corporate sustainability rating services.

4.2 The influence of the SBMI on the local context: Campania Region

One of the slogans of the Sada Group is "Closer to the territory", having always been committed to building and maintaining a solid link with the communities to which it belongs. This group is a clear example of how the planning and implementation of an SBMI can impact on the local context: there is a prevalence of local employees, an efficient collaboration with the main non-profit organizations in the area for the implementation of assistance programmes, a collaboration with local authorities and universities for projects that guarantee a better quality of life for citizens. The strong link with the territory has always created a direct and continuous relationship with the local authorities which, from time to time, propose initiatives and programs to the Group in the infrastructural, environmental and socio-economic fields.

«In particular, recently, -the Group's SBMI has had an impact on the Campania region thanks to a new network project: "100% Campania Network - sustainable packaging network" is a company that integrates not only the companies of the Sada Group present in Campania but also the *Cartesar*

group (company based in Pellezzano)» and gives the possibility of carrying out an integration upstream of the process, with the recovery of the pulp, paper and cardboard of our customers which then once again become reels, then boxes up to upon delivery to the customer. This whole procedure is traced, verified and validated by Bureau Veritas, a third-party body that is a world leader in control, verification and certification services for Quality, Environment, Health, Safety and Social Responsibility. In this way, the value of the territory starts from the territory and remains in the territory and this generates employment, creates recovery cycles and gives the customer awareness of the new life of his waste, thus knowing that that waste will once again become a box and will be able to use it.

Furthermore, during 2021, the Group supported the Sportello dei Sogni, a non-profit association, created with the intention of making the dreams of those suffering from cancer come true, as dreams are integrated into a process of care and support to the disease useful for the mental health of the patient. The donation made it possible to give patients a dream kit, intended for long-term or day hospital patients admitted to: San Giovanni di Dio and Ruggi D'Aragona hospital in Salerno; National Cancer Institute - Pascale Foundation of Naples; Pausilipon Pediatric Hospital oncohaematological department of Naples. The company then supported the Tempi Moderni association for the Hotel Chelsea photographic exhibition at Palazzo Fruscione in Salerno. Cultural association that was born with the aim of networking through culture and to create synergies that can make Salerno the starting point and reference point for the construction of a laboratory of energies and projects capable of acting as a driving force for social, tourist and economy of the urban fabric of Salerno. And, again, the Group has obtained the certification of gender equality and this is something that has an impact on the social and not only on the economic and environmental.

Investing in this territory rather than elsewhere is a sign of how much the Sada family cares about developing its territory and, all of this, creates a very strong link between innovation, sustainability and corporate competitiveness with its local roots.

Therefore, the SBMI contributes to local development in terms of:

- creation of economic opportunities: through the adoption of sustainable and innovative practices, companies can develop products and services that respond to the needs of the local community, generating employment, economic growth and investment;
- promoting local employment: implementing an SBMI can encourage local recruitment. Sustainable businesses often seek to engage the local workforce by providing job opportunities, training and skills development. This can improve the employment prospects and quality of life of local residents;
- preservation of the environment and natural resources: SBMI emphasizes the responsible management of natural resources and the reduction of environmental impact. Through the adoption of sustainable practices, such as energy efficiency, waste recycling and the use of renewable energies, companies can contribute to the protection of the local environment, preserving the quality of the air, water and soil;
- community involvement: SBMI actively involves the local community, taking into account the needs, opinions and expectations of the residents. Sustainable businesses can promote the involvement of local stakeholders, for example through collaboration with local organizations, support for community projects or involve residents in business decisions. This helps to create a sense of belonging and promote the social development of the local community;
- investment attractiveness: a company that adopts an SBMI can become more attractive to investors, including local ones. Investors are increasingly interested in supporting companies that integrate sustainability into their business model, as this can ensure long-term durability and contribute to the sustainable development of the region.

Overall, the SBMI can promote sustainable local development, balancing economic, social and environmental aspects. Through the adoption of sustainable practices and attention to the needs of the local community, companies can create shared value, generating economic benefits and improving the quality of life of people in the region.

4.3 The role of knowledge management (KM) in implementing an SBMI

4.3.1 KM for SBMI

The Training and Development function within the Sada Group is focused on improving the performance and fostering the self-fulfilment of its employees through a variety of educational methods and programs, from instruction in highly specific job skills, to long-term professional development. Training and development are an integral part of the company's strategy based on continuous learning as a means to promote employee growth and acquire a highly skilled, motivated and skilled workforce over time. This training process also includes the process of creating and disseminating knowledge which is expressed through the sharing of projects and more. It's important for the company that the parties talk to each other and that there is information sharing to obtain a functional SBMI; it is no coincidence that «in order to facilitate the knowledge management process, open innovations have been planned on a monthly basis», i.e. internal communication events open to management, management and owners in which everyone informs about other company cases, best practices, technologies useful for the operations of the organization and innovative projects that can be presented, so as to create an exchange of ideas and a comparison between the parties as well as insights and constructive criticisms, thus strengthening knowledge, favouring a positive learning environment and having feedback important for the continuation.

Furthermore, the company has always been careful to attract talent to its organization through a collaboration with the Department of Chemical Engineering of the University of Salerno with Matespack, the packaging master's degree in which the Group participates with scholarships, teaching and internships. Every year the Group supports the elaboration of theses and reports for students of regional and national universities. This allows the Group to enter ever-changing national university contexts and collaborate with industry associations on issues such as the environment and CSR; so surely the relationship between SBMI and KM creates improvements for the community.

Furthermore, the creation and dissemination of knowledge has a positive effect on the development of local relations: the relationship with suppliers is one of the pillars on which the development strategy of the Sada Group is based, which is determined and motivated to maintain and develop relationships with customers and suppliers who share your commitment to the protection of human rights and decent treatment of employees; safe working conditions in a healthy environment; a continuous reduction of the environmental and social impacts of productions and processes and the maintenance of the highest standards of ethical conduct.

While maintaining high attention to all innovative proposals, the company tends to favour long-lasting relationships with its local partners, based on trust, quality, reliability and knowledge sharing, remaining in constant search of new possibilities offered by local industries since dealing with local actors certainly allows you to understand what to work on and, therefore, actually have an exchange of value with them.

4.4 Data Analytics to support SBMI

The business model of the Sada Group, in addition to including principles of sustainability, includes technologies that can manage a large amount of data. In fact, the company has an office with state-of-the-art systems responsible for organizing data protection, privacy and cyber security, cleaning data and their reporting, their control and management, thus moving towards continuous improvement and a system that supports the sustainability report, in compliance with the annual objectives and KPIs. Innovation and sustainability, therefore, are closely interconnected: with sustainability it is necessary to monitor data, define objectives and work to ensure that they are achieved to be competitive on the market. For the company, in fact, it is important that the production process is based on data because if you do not monitor and have no awareness of the data, you cannot improve and support the decision-making process. In fact, this year statistical software has been installed which helps management to have greater control over the data and their

analysis, to make better strategic decisions. Certainly, there are critical aspects regarding data cleaning and this is the great work of those behind it and inserts them within the systems that must be thought out and reasoned.

Among the tools used by the Group is the MES, a computerized system that manages and controls the production process of all companies completely interconnected with the management systems used by the Group companies and compliant with Industry 4.0 programs and ERP, a new management system built on needs of the individual company Divisions, unique in the packaging sector definitively consolidated in Sada Packaging Verona, Sifim, Sabox and Sada Packaging Salerno. About cybersecurity, on the other hand, due to the continuous global cyber threats, the Group has developed an innovative system that uses technologies that collect preventive and predictive data on cyber threats. Carry out continuous monitoring, engineering a new model of IT perimeter protection and control and intrusion alert tests to keep protection against any hacker attacks high.

An SBMI presupposes data analysis and this is confirmed by the Sada Group's way of operating, because sustainability cannot be achieved if the data has not been collected; therefore, they are two things that are very connected. Sustainability means keeping things under control, be it personnel, sales, added values, production or quality. «You can't do SBMI if you don't do data analysis».

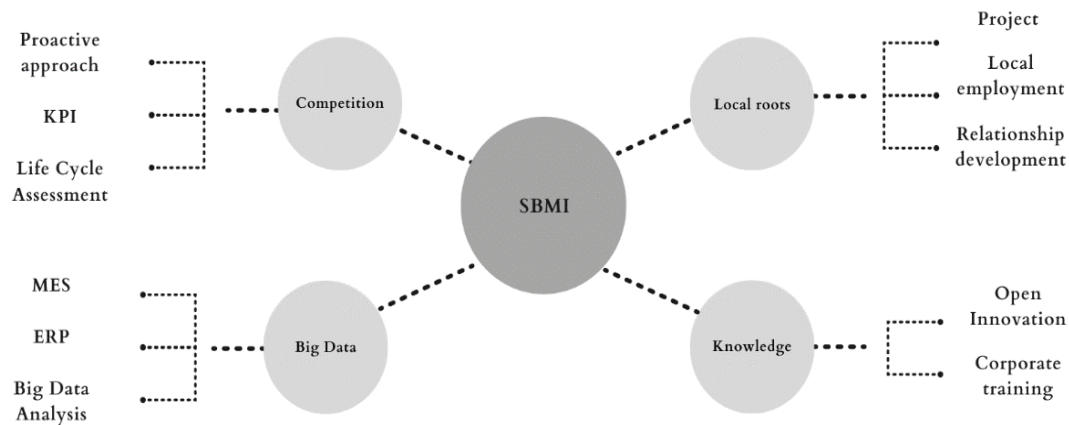
5. Discussion

The study had the objective of illustrating those paths that the company could take in adopting a sustainable innovation process, verifying the availability of knowledge and identifying knowledge management strategies useful for the development of SBMI. The results showed that competitiveness represents one of the main advantages of the organization and that digital innovation supports the implementation of this model, fully respecting the principles of sustainability. Furthermore, it has been highlighted that the creation and dissemination of knowledge has a positive effect on the development of territorial relations and that in the development of an SBMI it is essential to know how to manage and analyse data. In detail, the Sada Group is a company that embodies the values of the SBMI and this is expressed in its corporate activities, various and diversified, and a life-cycle assessment (LCA) process that makes it possible to improve processes and communicate the results of corporate sustainable development. The R&D Department of the Group, on the other hand, collaborates with the various players to develop innovative and sustainable solutions, providing for an improvement in compliance with the KPIs. Furthermore, the company - having the protection of the planet and the conservation of its natural resources at heart - annually presents a Sustainability Report which provides a detailed description of the economic, environmental, social, financial and digital performances.

The group has always been attentive to the development of the territory: it aims to hire local employees; opts for collaborations with local authorities to implement assistance programs and interfaces with the University of Salerno to design projects capable of improving the quality of life of citizens. Sada operates according to a logic of continuous improvement and this is why it ensures its employees training programs that promote their self-realization. The training process brings together the process of creating and disseminating knowledge which is expressed through the sharing of projects and more; moreover, the Group is willing and motivated to maintain and develop relationships with customers and suppliers who share its civil commitment. Finally, the company constantly analyses the data as it believes that innovation and sustainability are closely interconnected and capable of influencing the business model.

Therefore, starting from the results of the interview, it is possible to suggest, in Figure 1, a conceptual framework that represents how the processes of knowledge creation and management are essential in the development of an SBMI.

Fig. 1: Conceptual framework for SBMI



Our elaboration.

Thanks to a careful review of the literature, it was possible to derive the key dimensions of the SBMI indicated in Figure 1, thanks to which a company can adopt a logic based on ecosystems of services in which the actors of the system and the institutions integrate resources in order to co-generate value by taking advantage of digital devices (Troisi *et al.*, 2019) and, operating according to the holistic and integrated logic suggested by the conceptual framework for SBMI, managers are able to streamline the decision-making process (Polese *et al.*, 2016).

Furthermore, for each key dimension - following the interview and analysis of the data collected - a series of sub-dimensions were obtained which stimulate the process of development and innovation of the sustainable business model, representing real conductors of change in a network local (Troisi *et al.*, 2018). Extremely important in this study is the local roots and the analysis of big data: the Sada Group operates in the area and for the area in compliance with sustainability criteria and uses the analysis of big data as an element capable of ensuring an advantage competitive deriving from the ability to access and share common resources to create mutual value for the territory (Ciasullo *et al.*, 2016), supporting and harmonizing the dialogue with local actors to obtain a sustainable advantage (Troisi *et al.*, 2019). Indeed, Bashir *et al.* (2019) believe that the creation and dissemination of knowledge is a factor in business success, as it promotes innovation, encourages and motivates employees to share their knowledge, thus creating an excellent organizational culture.

6. Theoretical and managerial implications

Research on the implementation of sustainable and innovative business models has seen a huge increase in recent years but, despite this, there is a gap related to the role of knowledge in the adoption of SBMI. This study has theoretical implications as we tried to identify the potential of knowledge creation and the effects of its diffusion in the development of the business model, providing a framework and useful suggestions for future research. As early as 1974, Kerlinger provided a systemic vision of the business model, a vision that was confirmed by this study, since only by adopting a systemic approach aimed at integrating resources and technology, can a company co-create value today (Botti *et al.*, 2017) and consider themselves competitive on the market.

Furthermore, market changes imply that managers must respond adequately to them and shape their own company strategically (Schiafone, 2011). A company that designs SBMI by integrating KM and Big Data systems can increase its strategic value. Practical and managerial implications are foreseen, supporting management in corporate reorganization to face innovative challenges, respect the guidelines for local sustainable development and strengthen the link with one's homeland.

From a managerial point of view, the results of the study can shed light on the function of knowledge sharing in the development of a business model, allowing the territory to grow. These emerging trends in innovative and sustainable business model design highlight the importance of listening to customers, of co-creating new values and with the territory (Lee *et al.*, 2012). Therefore, the previously indicated conceptual framework shows management how to successfully implement an innovative and sustainable business model, focusing on dimensions such as: knowledge, competition, local roots and big data. Entrepreneurs need to design flexible business models that allow them to efficiently and sustainably reshape strategic choices to make better and faster business decisions. Therefore, the usefulness of collaborative work between users involved in knowledge management should be ensured to facilitate the creation of a functional structure.

7. Conclusion

By virtue of the results obtained, it is possible to confirm that the SBMI has a positive impact on company competitiveness and is capable of influencing the local context, thanks to a continuous exchange of internal and external knowledge of the company, from which it is possible to obtain information and data which are analysed for the development of the model. In fact, the document suggests that management strategically and systematically integrate SBMI, knowledge management and Big Data to pursue sustainable commitment objectives.

This study is the first of its kind: it has highlighted the synergistic effects of SBMI and knowledge on company performance and on the reference territory. The study increases the body of awareness and information on the role of knowledge for the adoption of an SBMI for local development, noting that knowledge management is an essential factor in the development of an innovative and sustainable business model and that it can be supported by an efficient data analysis capability.

This work opens the door to many avenues of potentially fruitful future research. Future research could examine the quantitative nature of the model, focusing on assorted samples. However, a more detailed and in-depth look at corporate performance could certainly be of interest to management researchers.

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Can authenticity be built? Looking for factors that influence authentic brand activism

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Abstract

Framing of the research. *The study focuses on brand activism, a phenomenon attracting increasing attention from researchers and practitioners. However, the literature on brand activism has developed over the last five years and still has many gaps that should be filled.*

Purpose of the paper. *This research analyses consumers' perceptions of Ben & Jerry's to understand whether it is perceived as authentic and, if so, to identify feasible factors contributing to consumer-perceived authenticity.*

Methodology. *We analysed the users' comments on the American Instagram profile of Ben & Jerry's by conducting a text network analysis to generate topical clusters (topic modelling) and identify the most influential keywords. Then, to address the research questions, sentiment analysis of users' comments has been employed.*

Results. *Topic modelling resulting from the analysis shows some exciting word clusters that allow hypothesising how activism is a critical element of Ben & Jerry's consumers' evaluation, becoming a topic of discussion at the same level as the brand's products. In addition, sentiment analysis contributes important insights, confirming the crucial relevance of authenticity in brand activism strategies.*

Research limitations. *The study uses user comments on posts, considering them as declarations, not actions; hence, we need to determine if consumer actions will be consistent with boycott declarations.*

Managerial implications. *This study contributes to understanding whether the condition of authenticity is verified for a brand known to be an activist. Additionally, we identify potential elements that contributed to the perceived authenticity of brand activism based on the obtained results and the analysis of social media profiles and the company's official website. Knowing consumers' sentiments is essential for researchers and practitioners, as it is the basis for understanding how consumers perceive and evaluate brand activism.*

The originality of the paper. *Brand activism is a hot topic in the literature. Insights from consumers' perceptions are crucial to explain the phenomenon of brand activism, useful in customer profiling and brand management, and address future research on the topic. Furthermore, it is essential to understand which factors can contribute to generating consumer-perceived authenticity in brand activism campaigns.*

Keywords: *Brand Activism, Authenticity, · Consumer Perception, · Social Media, · Socio-political issues*

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1. Introduction

Nowadays, consumers and other stakeholders are increasingly considering that corporate social responsibility (CSR) actions are no longer sufficient to solve the enormous challenges facing our generation, which have been exacerbated by the Covid-19 pandemic (Hesse *et al.*, 2021). They believe businesses should take a more proactive approach, particularly by demanding a public stance on sensitive themes (Maks-Solomon and Drewry, 2020). As a result of this presumption, companies have started to take sides for political, social, or economic reasons (Sibai and others, 2020), fighting to promote values ranging from social justice to inclusiveness through concrete actions that benefit the community (Eyada, 2020). As highlighted by Resciniti (2020), marketing is more important than ever in modern society because it can encourage the development of solutions to suit the needs of people, businesses, and institutions, enhancing the lives of people and society at large. This approach has also been heavily strengthened by recommendations from the American Marketing Association (AMA), which have emphasized the need to address research in this direction and created new terms like “Mitigation in Marketing” (Mende and Scott, 2021), “Better Marketing for Better World” (Chandy *et al.*, 2021), and “Marketing as a force for Good” (AMA, 2021). Many companies have started to take action about socio-political issues such as Nike supporting the Black Lives Matter movement (Schmidt *et al.*, 2022), Airbnb supporting refugees (Moreano, 2019), Gillette is against toxic masculinity (Xu and Xiong, 2020), American Airlines refusing to transport children separated from their parents by immigration officials, or Lush Cosmetics promoting an anti-Israel song (Weber *et al.*, 2023). Based on these premises, this study aims to investigate the consumers’ perception of a brand known to be an activist: Ben & Jerry’s. This brand has viewed its organization through the prism of social justice ever since it first opened its doors in 1978. “*Ben & Jerry’s is a company that seeks social justice and believes in a bigger calling to merely generate profits from selling products*”, the company declares in the content of its news releases (Ben & Jerry’s, 2017).

This study aims to analyse consumers’ perceptions of Ben & Jerry’s by collecting online users’ comments from the American Instagram profile of the brand. The United States (US) market was chosen because it is the primary market for Ben & Jerry’s and activism was born and developed in this country (Cammarota *et al.*, 2022). As a result, this country should be more sensitive to this theme.

The research questions of this study are twofold:

RQ1: How do consumers perceive brand activism campaigns?

RQ2: Are there factors that contribute to the authenticity of a brand’s activism? If so, what might they be?

2. Literature Background

2.1 The strategy of brand activism

The growing attention toward environmental and social issues from consumers and other stakeholders have conducted brands to take an active role in civil society. Additionally, as highlighted by Weber *et al.* 2023, another factor that has encouraged brands to commit to such issues (Scherer and Palazzo, 2021) is the relevant lack of trust in institutions and governments from citizens, who increasingly consider them as unwilling or unable to address these problems (Hita and Grégorie, 2023). In this scenario, brands have begun to compete in the political arena, becoming significant activists (Korschun *et al.*, 2020). Brands’ political role is called *brand activism* (Sarkar and Kotler, 2018). In literature, brand activism is also defined as a new marketing strategy (Shoenberger *et al.*, 2021, an intersection between politics and marketing (Klostermann *et al.*, 2022), a positioning tactic (Schmidt *et al.*, 2022), or an evolution of corporate social responsibility (Kotler *et al.*, 2021). Despite the relevant literature gap on the topic, brand activism is becoming a

more significant current and growing phenomenon both in the business and academic worlds (Cammarota *et al.*, 2021; Eilert and Cherup, 2020). The strategy of brand activism can be defined as a “public speech or actions focused on partisan issues made by or on behalf of a company using its corporate or individual name” (Moorman, 2020). In addition to making public statements (Bhargava and Bedi, 2022), activist companies can also take stances on controversial socio-political issues by making financial commitments (Klostermann *et al.*, 2022), working with social movements, NGOs, and other stakeholders (Wettstein and Baur, 2016), or even by modifying their products to show support or opposition to a particular cause (Koch, 2020).

Hence, through communication and practice (Kotler and Sarkar, 2018), brands express their opinions, concerns, or values in divisive public debates (Vredenburg *et al.*, 2020), such as those on issues like LGBTQIA rights, racism, cannabis legalisation, police brutality, abortion, or war. The goals of brand activism are manifold (Smaldone *et al.*, 2023); by getting involved in sensitive issues, brands hope to affect positive social change (Eilert and Cherup Nappier, 2020), not only by raising consumer awareness of these issues but also by positively influencing their behaviour and attitudes (Villagra *et al.*, 2020); furthermore, this strategy aims to get the attention of the media to such issues and to pressure policymakers and institutions advocates to address these problems (Den Hond and De Bakker, 2007). As a result, businesses use their visibility to shape public perception of these issues (Haski-Leventhal *et al.*, 2021). Although brand activism is a phenomenon under investigation by researchers and practitioners, especially in recent years, it seems clear that it could also have significant business impacts (Hita and Grégorie, 2023; Bhagwat *et al.*, 2020). In fact, a practical brand activism approach may result in significant market competitive advantages. Firstly, it could be a tool to enhance the brand-consumer relationship, with potential outcomes on the brand image (Hambrick and Wowak, 2021), brand reputation (Johnson *et al.*, 2022), brand attachment (Flight and Coker, 2022), consumer engagement (Kotler *et al.*, 2021), consumer loyalty (Key *et al.*, 2021), or consumer purchase intention (Zhou and Dong, 2022). Secondly, brand activism may also have favourable effects on the relationship between a company’s employees and investors (Bhagwat *et al.*, 2020). From this standpoint, using social media to communicate with stakeholders and announce one’s activist stance is essential.

Brand activism is a fundamental public action that manifests through advertising, public relations, and other online and offline communication (Korschun, 2021). According to numerous researchers (Pöyry and Laaksonen, 2022; Johnson *et al.*, 2022; Mukherjee *et al.*, 2022; Warren, 2021; Bhagwat *et al.*, 2020), the main issue of brand activism is its risky nature. Taking a stand on political and social problems could result in substantial economic, financial, and reputational harm if the brands do not act considering their history, mission, and values (Vredenburg *et al.*, 2020; Dodd and Supa, 2014).

2.2 Perceived Authenticity and consumers’ perception of brand activism

Perceived Authenticity is considered the most relevant factor in brand activism strategy (Schmidt *et al.*, 2022; Hesse *et al.*, 2022; Moorman, 2020). Consumers perceive an activist brand as authentic when its actions are truly motivated by a purpose and values (Vredenburg *et al.* 2020). Authenticity is the consistency between a firm’s actions and online and offline communication (Vredenburg *et al.*, 2020). Authentic brands frequently set themselves apart by being sincere, steady, consistent, credible, unique, real, and unattached to business interests (Yang and Battocchio, 2020; Bruhn *et al.*, 2012; Ballantyne *et al.*, 2006). Thus, this variable is fundamental to reaching a good impact on stakeholders and reducing their scepticism toward the activist position of the brand (Ahmad *et al.*, 2022; Mirzaei *et al.*, 2022; Villagra *et al.*, 2021; Hoppner and Vaddakkepatt, 2019). Based on this premises, when brands take activist positions that are not coherent with their history or values or when there is a difference between their practice and communication (Mirzaei *et al.*, 2020), brands are frequently perceived as being *inauthentic* in their activist commitment and accused of *woke-washing* (Sobande, 2019), a phenomenon similar to greenwashing but restricted to the world of activism. In such cases, consumers accuse businesses of utilising this tactic as a marketing gimmick

(Vredenburg *et al.*, 2020) in order to boost sales. Therefore, it is essential to be perceived as genuine mostly by one's target consumer (Ahmad *et al.*, 2022). Consumer responses to brand activism could be varied and highly fragmented, mostly because activism focuses on contentious issues on which the public strongly disagrees (Vredenburg *et al.*, 2020); additionally, these issues do not present a universal and accepted solution by all individuals (Vredenburg *et al.*, 2020). Consequently, brand activism often generates primarily negative and polarised sentiments and attitudes (Hita and Grégorie, 2023), contrary to other initiatives like corporate social responsibility or cause-related marketing, which garner more positive responses from customers (Mukherjee and Althuizen, 2020).

If, on the one hand, consumers increasingly expect companies not to remain neutral on certain issues, on the other hand, they often react negatively to brand activism by initiating a backlash (Atanka *et al.*, 2022; Sarkar and Kotler, 2018), even boycotting brands (Neureiter and Bhattacharya, 2021; Nguyen and Nguyen, 2020). Consumers' negative response can be attributed to two main factors: firstly, they believe the brand is inauthentic in its activist stance (Schmidt *et al.*, 2022); secondly, they may not share the stance and values promoted by the brand (Atanka *et al.*, 2022). In both cases, consumers could express their disapproval through boycotts or other means of dissent; this backlash can be intense (Pöyry and Laaksonen, 2022), especially when it's fueled by social media platforms (Klostermann *et al.*, 2022). According to the extant literature (Weber *et al.*, 2023; Moran *et al.*, 2021), social media platforms are a crucial channel for spreading negative sentiment.

User-generated content's sentiment has important effects on businesses' brand reputation and financial performance (Rust *et al.*, 2021). Nowadays, thanks to social media platforms, consumers can publicly express their negative emotions through electronic word-of-mouth (eWOM) (Zhou and Dong, 2022; Bhagwat *et al.*, 2020), generating firestorms (Klostermann *et al.*, 2022; D'Arco *et al.*, 2019), or even creating anti-brand communities (Pöyry and Laaksonen, 2022; Brandão and Popoli, 2021). Additionally, some studies suggest that brand activism has a stronger negative impact on people who disagree with the promoted cause than it does on people who support it (Mukherjee and Althuizen, 2020). Anyhow, brands involved in socio-political causes can also obtain positive consumer responses and be supported in their activist actions (Hydock *et al.*, 2020). As was previously reported, positive sentiment derives mainly from two conditions: the brand must be perceived as authentic in its activist stance, and it should promote values shared by its consumers. According to Johnson *et al.* (2022), almost two-thirds of consumers are willing to support or reject a brand based purely on the social ideals promoted by it.

As a result, values seem to be a key determinant of consumers' decisions (Chatman, 1991), guiding their behaviour and attitudes toward a brand. Consumers tend to prefer products and brands that represent their values and identities (Hydock *et al.*, 2020). By associating with identity-coherent brands, they are able to express a version of their self-concept (Reed *et al.*, 2012), also strengthening the consumer-brand relationship. As highlighted by Hydock *et al.* (2020), consumers identify with politically aligned brands and disidentify with politically misaligned brands by them. Consequently, if a brand is perceived as authentic in its activist commitment, it could be assumed that this could generate important benefits not only to civil society but also to the company itself.

3. Research Design

The case of Ben & Jerry's

A fascinating case study to better understand the phenomenon of brand activism and related consumer responses is Ben & Jerry's, known for its activism. Ben & Jerry's is the fourth most popular ice cream brand worldwide (Zhou, 2016). Since its debut in 1978, this brand has distinguished itself for its social commitment (Ciszek and Logan, 2018). This is due to its operating philosophy of *capitalism infused with activism* (Gelles, 2015). The brand actively supports several topics, including police brutality, legalising marijuana, LGBTQIA+ rights, and abortion. In fact, on October 6, 2016, Ben & Jerry's made a contentious public statement on its social media sites

endorsing the polarizing Black Lives Matter campaign. The brand's posts are often controversial, sharp, and specific; we report a Ben & Jerry's Instagram post in figure 1.

Fig. 1: Ben & Jerry's Instagram post against policy brutality



Additionally, in 2009, the business temporarily changed its name to Chubby Hubby to honour the passage of the same-sex marriage statute in Vermont, where Ben & Jerry's headquarters are located (Wettstein and Baur, 2016). The underlying principles and vision of this company, which are focused on the social role that Ben & Jerry's intends to play in society, are the key success factors of its activism.

Research Method

This research is exploratory since the topic being examined is still relatively unexplored and needs to be structured. Since Ben & Jerry's is distinctive and has a long history of supporting social causes, we only focus on one single case; in this way, we can gain deeper insights by conducting a more thorough investigation (D'Arco *et al.*, 2019). The study examines users' comments posted on Ben & Jerry's American Instagram profile to identify how consumers perceive the company's activism.

According to Marino *et al.* (2020), online scraping and data analysis offer marketing researchers and practitioners a unique opportunity to analyse people, communities, and society. Social media constitute a very diverse and wide-ranging source of information. Instagram was chosen as the platform for data collection because, compared to other social media platforms, it provided more data in the form of comments. Data were scraped from the company's official US Instagram profile, which covered all posts between 2020 and 2022. About 58k comments were gathered in total, with 12k for 2020, 31k for 2021, and 15k for 2022. After reading each dataset and cleaning it, such as by deleting duplicate comments, we uploaded the datasets to Infranodus to perform a text network analysis and a sentiment analysis for each year. To locate related words and group them into thematic groups, Infranodus uses graph theory rather than a probability distribution. With the aid of sophisticated visualisation tools, which can be used for both quantitative and qualitative research, this application of graph theory helps to understand better the structure of textual discourse (Paranyushkin, 2019).

The main goal is to obtain a more profound and wide-ranging description of the phenomenon, identifying not only consumer perceptions through sentiment analysis but possible factors that

could have impacted the consumer perceived authenticity toward the brand. For this aim, the topical clusters, derived from topic modelling and keyword extraction, helped us to understand better Ben & Jerry's activism and which variables most influence consumers.

4. Findings and Discussion

Consumer responses to brand activism on social media platforms seem to depend on multiple factors, such as post content, reporting period and supported issues. In our analysis, we examined users' comments on the American Instagram profile of Ben & Jerry's for three years 2020, 2021, and 2022.

Topics and relations

We identified, through topic modelling, the main clusters that emerged from each year's comments. Four main clusters were found in 2020: Ben & Jerry's (20%), Chunky Flavors (19%), Political Ice Cream (17%), and Cheesecake Bliss (14%).

The main keywords in the *political ice-cream cluster* included "Biden", "people", "political", "joe", "white", "country", "justice", "vote", "issue", "Trump", "call", and "support". By analysing the relationships among the most frequently used words, the top twenty words related to brand activism were identified with their targets, occurrences, weight, and betweenness.

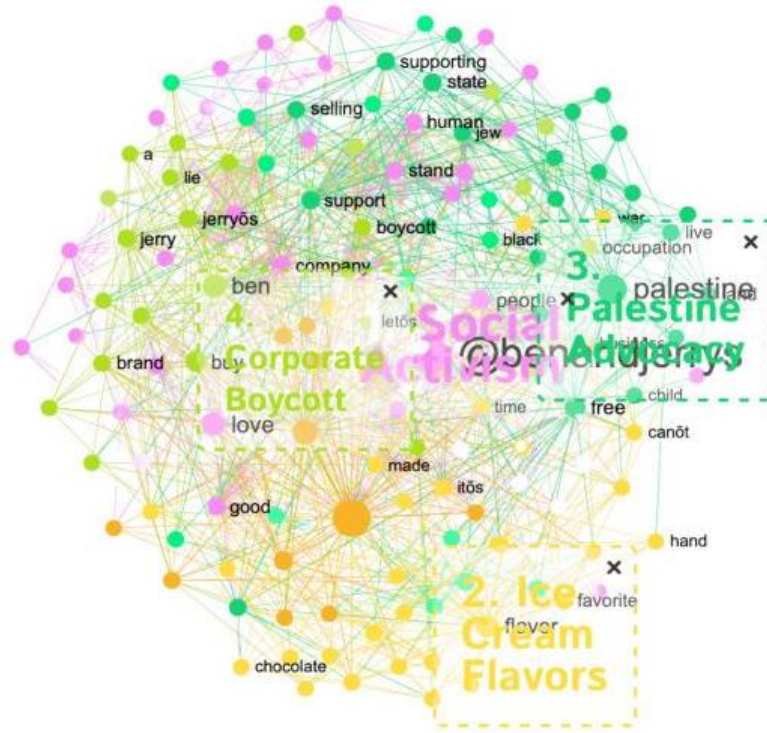
Tab. 1: Keyword Relations Analysis 2020

source	target	occurrences	weight	betweenness
Biden	Harris	8	64	0.0134
vegan	version	14	41	0.0002
@benandjerrys	vote	9	39	0.7973
free	flavor	14	33	0.1975
love	company	14	33	0.2600
@benandjerrys	real	8	27	0.7576
free	version	9	27	0.0134
live	matter	9	27	0.0127
black	people	8	27	0.0419
love	dairy	10	26	0.2841
flavor	vegan	13	26	0.1843
buy	ben	9	26	0.0720
vote	Trump	10	26	0.0397
@benandjerrys	vegan	8	24	0.7577
white	people	7	23	0.0167

In 2021 the top clusters identified were: Racial Justice (26%), Ice Cream Flavors (20%), Palestine Advocacy (17%), Ben & Jerry's Boycott (12%).

Some of the words identified are, for the *Racial Justice cluster*, "racist", "movement", "policy", "Jewish", "hate", "history", "American" and "standing". For this cluster, we specifically allude to the Black Lives Matter Movement, which drew a wide range of reactions, including widespread support, confusion, honest inquiries, and some hostility. For the cluster *Palestine Advocacy* they are "Palestine", "free", "state", "support", and "shame" while for Ben & Jerry's Boycott, they are "Unilever" "boycott" "lie", "anti-Semitic". The decision by Unilever to sell Ben & Jerry's ice cream in the occupied Palestinian territory is specifically discussed in this cluster. We discovered the fans' and partners' trusted worries. A long-standing business relationship exists between Ben & Jerry's and their licensee, who produces and sells ice cream in Israel. They decided not to extend the contract when it ends at the end of the following year to change this.

Fig. 2: Infranodus topic modelling results from 2021



By analysing the relationships among the most frequently used words, the following top twenty words related to brand activism were identified with their targets, occurrences, weight, and betweenness.

Tab. 2: Keyword Relations Analysis 2021

source	target	occurrences	weight	betweenness
free	Palestine	44	132	0.2886
human	right	10	29	0.0137
speak	Palestine	11	27	0.2292
boycott	ben	8	22	0.1205
@benandjerrys	Palestine	5	18	0.6817
illegal	Israel	6	18	0.0172
support	Palestine	6	14	0.2499
support	state	5	14	0.0524
boycott	jerry	6	12	0.0369
stop	selling	4	12	0.0081
social	justice	4	12	0.0042
supporting	Palestine	4	11	0.2474
law	racist	4	10	0.0022
occupied	territory	4	10	0.0028

The clusters Corporate Abuse (18%), Political Activism (16%), Spiritual Reflection (16%), and Baked Treats (12%) were identified for 2022.

For the *Corporate Abuse cluster* some of the most frequently used words are “murder”, “animal”, “woman”, “rape”, “Iran” and “slavery”. For the *Political Activism cluster*, they are “people”, “vote”, “politic”, “choice”; while for *Spiritual Reflection* “political”, “police”, and “moral”. The Corporate Abuse cluster is related to several issues highlighted by consumers. First, it is associated with comments regarding Ben and Jerry’s position on selling vegan products. It is also associated with its position in the Iranian situation. In fact, the company was accused by many followers of not being active enough on this topic.

The most pertinent remarks in relation to topical clusters on political, economic, and social issues are included here. They demonstrate how consumers react to the activism of Ben & Jerry's.

Tab. 4: Comments analysis of the main clusters

MAIN CLUSTERS	COMMENTS	SOURCE	SENTIMENT
Racial Justice	Use your platform to address settler colonialism in Palestine. For a year you've been speaking up on racial justice and human rights.	Instagram	Negative
Palestine Advocacy	@benandjerrys why do you have a factory in an illegal Israel settlement in occupied Palestine? stop supporting ethnic cleansing and putting on a fake woke veneer. FREE PALESTINE Ben & Jerry has been silent on their corporate stand against the Israeli government ethnic cleansing of Palestine.	Instagram	Negative Negative Negative
Ben & Jerry's Boycott	Every occupying state must be boycotted just as we must boycott the United States that conquered its territory from the Indians. #BoycottUSA	Instagram	Neutral
Corporate Abuse	Is all oppression connected? Including the oppression, abuse, rape, and murder of animals. Your company profits off of and enables the dairy industry: a cruel, oppressive, abusive, and totally unnecessary entity. Racism, ableism, homophobia, transphobia, misogyny, and speciesism is everything wrong with the world. See YOUR part in it, Ben & Jerry's? The hypocrisy is insane. Thank you for supporting Israel! Thank you for all that you do and advocate for!! Love your products and supporting your company! You guys are the best. Truly an organisation I want to financially support and would love to work for.	Instagram	Negative Negative Positive Positive Positive
Political Activism	WARNOCK ALL THE WAY ???????? GO GEORGIA!!!!!! Come on Georgia we need you to show up and show out??????? #votewarnock It's crystal clear their is a good candidate and a terrible candidate. Choose wisely Georgia! The world is watching you. GO VOTE! And Vote For Warnock! Vote red save Georgia and the country! Oh great political Ice cream Aren't you an ice cream company? Stay out politics. Your responsibility is to make money for your shareholders.	Instagram	Neutral Neutral Neutral Neutral Neutral Positive Negative
Spiritual Reflection	I love your moral compass. White Russian for the love of god and donate proceeds to the Ukraine. I'm a teacher and I can tell you a lot is at stake this November! Republicans want to take away puberty blockers, cross sex hormones and even gender affirming surgery! this is the most important election of our lifetime! Love this and yes please vote.	Instagram	Positive Neutral Neutral Positive

The comments analysed concern in particular the social initiatives carried out by the brand: *Voting Rights, Racial Justice, LGBTQ+ Rights, Climate Justice, and Campaign Finance Reform.*

These five areas of intervention are clearly and precisely stated on the official Ben & Jerry's website; they appear to be macro topics on which the brand intervenes by supporting small and specific causes pertaining to each area.

Through the analysis of the main topics covered and relations, on the other hand, significant differences in the three years are noticed. First of all, it seems to be that Ben & Jerry's posts have become a space for discussing current issues in line with the brand's central values.

In 2020, an intense discussion on Voting Rights emerged, making particular reference to that year's election; for example, one relation identified "@benandjerrys" as the source and vote as the "target" and several keywords such as "Biden" and "Trump". In 2021, however, an increased focus on social and racial justice was detected. The Israel-Palestinian crisis attracted increased attention through polarised comments encouraging support and action for human rights. The same themes were also identified in 2022, focusing on brand political activism. With respect to these themes,

consumer perceptions were varied, giving room for greater neutrality in the years 2020 and 2021. In general, there is a lower percentage of negative comments and this is a particularly interesting result in the context of brand activism strategy. Through a deeper analysis of the comments, it was found that followers have a greater tendency to argue their position on particular topics of interest more challenging than to give their own assessment of the brand's own activist actions giving room for greater neutrality of sentiment. While consumers have a favourable and neutral attitude toward the brand and its activist positions (Cammarota *et al.*, 2022; Radanielina Hita and Grégorie, 2023; Atanka *et al.*, 2023; Pöyry and Laaksonen, 2022; Neureiter and Bhattacharya, 2021), over the course of three years, many more positive comments were noted.

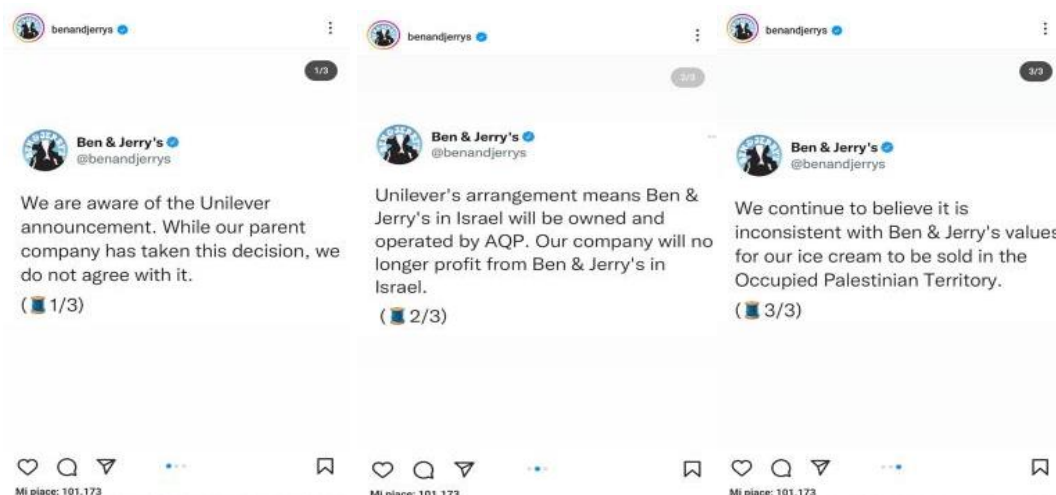
According to the results, consumers perceive Ben & Jerry's to be particularly authentic in its activist stance; moreover, on issues for which the brand does not advocate, consumers react negatively, expecting and demanding a greater degree of intervention. This could imply that the brand is recognised as an activist and that its stance is perceived as authentic. Hence, we examined Ben & Jerry's social media platform as well as its official website to identify potential factors that could explain consumers' perceived authenticity of Ben & Jerry's activism.

In particular, we have identified the following factors that could contribute to its authenticity.

- A strong *engagement strategy* based on “take action” and “call to take action”, reports on both social media and the brand's official website. The brand adopts a *process of educating* consumers by making them not only sensitive to specific issues but by making them aware of what might be the best concrete and immediate actions to implement.
- The brand's *continuity* in promoting human rights, social and economic justice, and environmental protection. From its inception, the brand has always been guided by its core values and by giving a hidden purpose to its products.
- Its commitment to promoting activism is well understood and documented on its website and in previous years' posts, ensuring *transparency*.
- Strong *familiarity* with U.S. social issues, thus high consideration of controversial issues related to the *proximity* of the territory where they are most discussed.
- Take stance on *highly controversial* and *specific issues*, not limiting itself to hot media topics of the moment but ensuring continuity in promoting its core values.

Although there is a greater positivity of comments, negative comments were noted in 2021 and 2022 related to the brand's response to Unilever's decision to sell the Ben and Jerry's ice cream business in Israel to a local licensee in violation of the agreement between the two companies. Despite this, it is evident how authentic Ben and Jerry's is in its decisions, addressing controversial issues without abandoning its values.

Fig. 5: Ben & Jerry's posts about their response to Unilever announcement



5. Conclusion, implication, and future directions

Brand activism is an interesting business trend of the last decade (Korschun, 2021). However, we still need to understand the effects of a brand strategy, how to measure them, and how brands can take activist positions perceived as authentic by stakeholders. This study aims to identify consumer perceptions of Ben & Jerry's activism and, in the case of favourable or neutral responses, identify potential elements that may have contributed to the brand's authenticity in its activist stance.

Findings enable us to make advancements in the knowledge of brand activism. Firstly, contrary to the other analysed cases (Cammarota *et al.*, 2022) and the current literature (Radanielina Hita and Grégoire, 2023; Atanka *et al.*, 2022; Pöyry and Laaksonen, 2022; Neureiter and Bhattacharya, 2021), consumers have a favourable and neutral attitude toward the brand and its activist positions. Secondly, findings confirm the relevance of authenticity in the brand activism strategy (Schmidt *et al.*, 2022; Hesse *et al.*, 2022; Key *et al.*, 2021; Vredenburg *et al.*, 2020); thirdly, they allow us to hypothesise possible factors that contribute to generating authenticity for the brand and its activist stance. The novelty of this study lies in the finding that not all activist brands are perceived as inauthentic, attacked by negative eWOMs, firestorms, or boycotted. There are brands like Ben & Jerry's whose market positioning, competitive advantage, and perhaps even loyalty of its consumers depends precisely on its being an activist brand.

We could confirm through this initial investigation that authenticity appears to exist for this brand, and we started to pinpoint potential elements that could generate perceived authenticity for Ben & Jerry's. These first identified factors will have to be analysed and studied in detail by future research, as Ben & Jerry's can be an interesting case study of authentic brand activism. The research agenda for this topic is extensive and fascinating because there is so much undiscovered ground to cover. Future research should look into not so much the importance of authenticity in brand activism strategy but rather how to generate this authenticity, which brands may or may not be activists, and on what elements this corporate decision should be made; as pointed out by Korschun (2021), activism is not a possible action for all brands.

This study has also theoretical and managerial implications since it advances knowledge of consumer attitudes and perceptions of this novel marketing strategy as well as the construct of authenticity, a key component of brand activism. In order to address companies toward potential and better implementation of activism and to outline insights for future research that can make the phenomenon more understandable, measurable, and implementable by companies in a manner consistent with consumers' expectations and ideologies, it is crucial for practitioners as well as researchers to understand consumers' responses and attitude to brand activism.

Finally, there are some limitations to the current study. The study is based on user comments, which are treated as declarations. Given that consumers frequently declare to boycott or support activist brands, we are not able to investigate whether any boycott declarations will be translated into consumer actions. This study should be supported with other quantitative methods, such as surveys to test intentions or experiments and conjoint analysis to test consumer behaviour.

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Ecofeminism and entrepreneurship: The case study of People's Bank of Govanhill

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Abstract

Framing of the research. *Our research is based on the Ecofeminism framework through the interpretative lens of degrowth within an entrepreneurial organization.*

Purpose of the paper. *The purpose of this paper is to show the characteristics of Ecofeminist entrepreneurship and the differences between this type of entrepreneurship and the classic business models that follow neoliberal principles.*

Methodology. *A case study methodology on a leading organization based on Ecofeminist and degrowth principles has been chosen.*

Results. *The main result of this study is to show how Ecofeminist entrepreneurship considers the economy as an iceberg, as it focuses on the principles of freeganism, anti-racism, the centrality of art, and equitable research.*

Research limitations. *The main limitations of this research are that only a single case study was analyzed and only in a theoretical way due to the nature of the Ecofeminist projects.*

Managerial implications. *The main managerial contribution is to stimulate the birth of new Ecofeminist entrepreneurship by providing guidelines for women entrepreneurs and governments so that they can develop policies that facilitate the creation of this type of organization*

Originality of the paper. *The concept of Ecofeminism has become quite popular among scholars and practitioners in the era of sustainable development. New organizational forms are born based on new principles such as social justice and equity. Ecofeminist entrepreneurship redistributes value to the most disadvantaged segments of the population, focuses on women's artistic creativity in value creation, and promotes more ethical and sustainable consumption models.*

Key words: *Ecofeminism; Sustainable innovations; Alternative organizations; Degrowth*

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1. Introduction

In recent years, the digital revolution has developed new business models that have made it possible to accelerate the globalization process by simplifying the exchange of products and improving the supply chain (Bican and Brem, 2020). Nevertheless, despite these improvements, there are increasing environmental impacts due to bigger exploitation of natural resources and consistent social divergences continue to grow (Korhonen *et al.*, 2018; Ferragina, 2019).

For limiting these problems, on the one hand, more and more businesses are implementing circular economy strategies to reduce the environmental effect of resources and optimize the management of natural resources (Nascimento *et al.*, 2019). Nevertheless, this may not be enough to avoid depleting natural ecosystems (Corvellec *et al.*, 2022). According to the Jevons Paradox, resource efficiency leads to an increase rather than a decrease in long-term resource utilization (Korhonen *et al.*, 2018). For this reason, it is complex to implement sustainability following the capitalistic economic model because, even if we consider the advantages to implement circular economy, the use of resources is increasing (Corvellec *et al.*, 2022). Therefore, according to Pansera and Genovese (2021), it is necessary to adopt the circular economy perspective with a critical approach that is not apolitical and that considers alternative economic models more in line with sustainability principles.

On the other hand, social entrepreneurship is assuming a central role in reducing social inequalities (Guerrero *et al.*, 2021). However, although this form of entrepreneurship has brought positive changes, several researchers believe that it is not enough to introduce social innovative forms that follow neoliberal principles but that it is necessary to adopt more radical forms of social innovations that follow new economic models (Nicholls *et al.*, 2015; Newey, 2018). By crossing these two perspectives, a type of entrepreneurship that puts disadvantaged sections of the population in the foreground, creating innovative forms that are not apolitical, is Ecofeminist entrepreneurship (Spiegler and Halberstadt 2018; Bertella, 2018).

Ecofeminism was initially recognized by feminist thinker Françoise d'Eaubonne and has been explored by other feminist thinkers (Estévez-Saá, and Lorenzo-Modia, 2018). Ecofeminist philosophy may be linked back to constructionist theorists, and other postmodernists. These theorists created the deconstruction tools that feminists have used to critically evaluate dominant societal discourses about privilege, modernity, and the power of authority and knowledge (Brisolara, *et al.*, 2014). Indeed, according to Ecofeminist theory, technology, economics, and all anthropical activities are subsystems of the natural environment. On the contrary, our economic and social systems grow with the assumption that the natural environment is at the service of anthropic activities without considering that once human beings have exhausted natural resources, economic activities will decrease (Hrestic and Popescu, 2022). Ecofeminism affords a greater comprehension of the multifaceted and interconnected crises we face; it facilitates a better understanding of why the real economy is at an impasse and does not generate jobs; it shows a better understanding of how the migratory movements that are being generated differ from the past and, it reflects why capitalism is destroying natural ecosystem (Fraser and Jaeggi, 2018). Indeed, Ecofeminism emphasizes that capitalist production is based on a precondition: the production of life, which happens in invisible areas and follows a logic opposed to that of capital. The contributions that daily and cyclically recreate both human existence and the living environment are out of focus, rendered invisible, and subjugated. Women, territories, colonial people, animals, and plants exist in these hidden areas to satisfy human wants while also allowing capitalist production to exist (Bell *et al.*, 2020). The sanctification of money as the motor of life - replacing biodiversity, fertile land, sun, water, or interdependent relationships - leads a large portion of people to believe that what they need is money because it allows them to obtain everything they need to sustain life, and on this belief, a sacrificial logic, a dogma, is established, which defends the fact that everything - territory, freedom, dignity and, relationships can be sacrificed for economic growth (Schüßler *et al.*, 2019). Therefore, Ecofeminism emerged primarily as a result of the disintegration of meta-narratives of oppression rooted in market economics, combined with natural ecological theory: “a

feminist/ecological domination theory rooted in the toxic ideology of patriarchy” (Brass, 2013). As a result, Ecofeminism results are strictly connected with degrowth and sustainability, and alternative economic models (Perkins, 2019).

Degrowth's purpose is neither to impede GDP growth nor is it equal to recession in a growing economy. GDP may fall as a result of degrowth measures, but only in environmentally and socially sustainable ways redistributing natural resources, (Demaria *et al.* 2013; Mastini *et al.*, 2021). Therefore, degrowth activism shows alternatives to capitalism and Ecofeminism in one of these options (Escobar, 2015).

Although Ecofeminist theories have been addressed in detail in the literature, there are no studies concerning the organizational forms that follow Ecofeminist principles. For this reason, the goal of this study is to close this gap to understand what are the characteristics of entrepreneurship that follow the Ecofeminism principles. Thus, through the analysis of the case study of the People's Bank of Govanhill, we aim to answer the following research questions.

What are the characteristics of Ecofeminist entrepreneurship? How does this type of organization differ from the classic neoliberal business model?

This paper brings two main contributions. From a theoretical standpoint, this research brings a contribution to the literature on sustainable innovations, degrowth, and Ecofeminism literature demonstrating how new organizational models can go beyond the capitalistic model by showing that it is possible to create tangible value even without considering monetary value. From the managerial standpoint, we want to stimulate the birth of new Ecofeminist entrepreneurship by providing guidelines for women and for encouraging governments to develop policies that facilitate the creation of this type of organization.

We will develop this paper as follows: first, we will describe the theoretical framework of Ecofeminism. Second, we will show the methodology used to analyze the case study. Third, we will reveal the results of the analysis. Fourth, we will indicate the theoretical and managerial contributions. Finally, the conclusions and main limitations of our study will be presented.

2. Theoretical framework: the principles of Ecofeminism

Ecofeminism is a theory that connects the crisis caused by capitalism regarding the relationship between nature and the environment and the crisis of social reproduction (Bauhardt, 2014). Any market economy's expansion is based on the exploitation of labor and natural resources. Indeed, both care labor capacity and natural resources in the capitalist systems are considered infinite supply (Leonardi, 2019). Therefore, these two crises are seen by Ecofeminist political economics as two processes that are inextricably linked.

The term depletion describes the harm that results from the overburdening of women in social reproduction and the depletion of natural resources and the earth's carrying capacity. From the environmental point of view, the limited quantity of natural resources is how ecological analysis characterizes the ecological crisis (Alvarado *et al.*, 2021). These can be raw materials like mineral reserves, oil, gas, uranium, or rare earth elements. Although these essential components of industrial production are valued and sold as products based on their scarcity, the negative effects of their usage on people and the environment are uncontrolled. They are therefore free for a profit-driven system that transfers the costs of its decisions to people and the environment (Raza, 2022). Economists know this process as the externalization of social and ecological costs. Since food, water, and air are fundamental prerequisites for essential metabolic processes, their scarcity or unfair global distribution directly affects how human life can regenerate (Marín-Beltrán *et al.*, 2022).

Instead, from the social point of view, the Ecofeminist theory analyzes how the ecological crisis is connected to the gender hierarchy and, exacerbates social reproduction. Because caring for others requires a lot of time and cannot respond to the call for rationalization made by the capitalist production mode, various authors have described the crisis of social reproduction as the under-

provision of care for those who rely on it (Massaro, 2020). The crisis relates to the excessive burdens placed on those who oversee social reproduction, the vast majority of whom are women because of the gendered division of labor (Abramovitz, 2023). Indeed, women continue to be accessible for social reproduction thanks to the average 25% continuous gender wage disparity that exists in developed nations (Abramovitz, 2023). Furthermore, women are burdened with not only caring for those in need but also with the additional expenses brought on by the ecological crisis. This is the case, for instance, when women in developing countries must travel further and spend more time collecting water because of increased desertification (Amoah and Addoah, 2021). This is also the case when large-scale transportation infrastructure planning in industrialized nations ignores the daily mobility patterns of women because of reproductive work (Uteng and Turner, 2019). Hence, it result useful to conceptualize together these aspects to find solutions that can reverse both negative effects (Daskalaki *et al.*, 2021).

3. Methodology: A case study analysis

We will use the case study technique (Yin, 2009) to understand the characteristics of Ecofeminist entrepreneurship and how it differs from organizations that follow neoclassic economic principles. As a result, to address our research questions, we will look at what people are involved, what are the economic principles that support this type of entrepreneurship, what are the goals of an Ecofeminist project, and how exchanges take place within these organizations.

We have chosen the case study methodology for two main reasons. First, it provides a full and “in-depth” explanation of a new sociological phenomenon. Second, this method allows for direct as well as analytical analysis (Meyer, 2001).

A literature analysis of the documents, and material collected from the project website and elaboration of previous studies were used to assess the People’s Bank of Govanhill case study. To advance the investigation, we will use an exploratory technique as soon as possible. Till now, this research is mainly theoretical because it was difficult to interview the people engaged in the project because of the characteristics of Ecofeminist entrepreneurship (as explained in the following section).

Despite some common weaknesses of this methodological approach, primarily statistical significance and selection bias, case studies have numerous strengths, including a) depth of analysis, b) high conceptual validity, c) understanding of context and process, and d) fostering new hypotheses and research questions (Yin, 2013). Indeed, a case study reveals normal and difficult moments and meanings in people’s lives in a natural setting (Hirsch and Gellner, 2020). A case study is an in-depth investigation of a small number of units, gathering information “about a single item, event or action, such as a particular business unit or organization that is exactly the subject of our research. Another argument for this decision is that, in a case study, all the material may be presented systematically (Yearley, 2000). We believe that this project is an effective instance of the qualities of an eco-feminist organization since the People’s Bank of Govanhill Company is an eco-feminist organization that has previously shown a successful project (Howson, 2021).

We have applied this method using documents, previous interviews, and internet sources. We are programming to implement a semi-structured interview as soon as Annie Rutherford, the founder of the project, accepts the interview proposal.

4. Results

4.1. The case study

The People’s Bank of Govanhill was founded by artist Ailie Rutherford during a residency with the Govanhill Baths Community Trust in 2015 and is now run collectively. The People’s Bank of

Govanhill evolved from a series of currency experiments, ad hoc exchanges, on-the-street discussions, and workshops mapping intersecting local economies into a long-term collaborative project. They continue to look for methods to put feminist economics into action on a local level, advocating for a radically new economic system and alternative solutions to capitalism (Howson, 2021).

In September 2018, Allie Rutherford created a Swap Market, repurposing a derelict pawn store into a location for trading and cooperating without the use of money. Swap Market operated skills and knowledge exchange, promoting the trade of commodities, customs, and civilizations. With almost 2,000 participants, the project mixed art and action to generate collective thoughts about what a better economic system might look like if created properly. They conducted events, film screenings, presentations, art projects, and workshops on community commoning, climate change activism, degrowth, and feminism. Since October 2020 they are moved to an online platform where they organize most of their activities (McLean, 2022).

4.1.1. *Economy as an iceberg*

This Project is based on the principles of economics as an iceberg (<https://thepeoplesbankofgovanhill.wordpress.com/about/>). This framework acknowledges and celebrates the various economic activities that keep our lives going (Gibson-Graham, 2002). The market economy is generally recognized as the top of the iceberg. However, many additional economic activities are concealed from view, even if these activities contribute to individual and communal well-being. It includes forms of illegal labor, alternative markets of services and goods exchanges, no capitalistic enterprises, cooperatives, volunteering, unpaid work, etc. (Collard and Dempsey, 2020).

Therefore, researchers have used the economy as an iceberg to define the submerged economic characteristics inside entrepreneurial activities (Williams, 2011). While above the iceberg is represented the classical economy and the functioning of classical business models where to exchange products it is necessary to use a credit card or use mortgages, the characteristics of this business idea are those found at the bottom of the iceberg which are represented by:

- 1) **Timebank:** This project follows the principles of Ecofeminism by reconsidering work in terms of time rather than following market principles. The people who join this project don't utilize money but time and availability. Members of the Bank engage in a reciprocal trade of services and time, providing what they can and getting what they require (Han *et al.*, 2019). It is a kind of cooperation, not volunteer work, in which participants assist one another in completing the project's responsibilities and commitments. The time that is exchanged within this project is not only for practical management tasks but also for teaching courses (especially art) and/or skills useful for creating entrepreneurship that follows the principles of Ecofeminism.
- 2) **Gift economy:** The gift economy is also being tested as part of this project. The gift economy denotes an economic system based on the use value of things and products, where there is a reciprocal trade of goods (with a non-monetary economy perspective), and lacking explicit commitments of immediate or future compensation (Zhang *et al.*, 2019). Although some reciprocity is expected, gifts are not expressly traded for products, services, or money, which distinguishes it from the market economy.
- 3) **Clothes swapping:** A clothes swap is a form of meeting in which participants trade valuable but no longer used clothing for new apparel. Clothing exchanges are regarded not just as a smart method to replenish one's wardrobe, but also as an act of environmental stewardship. It is also used to dispose of and acquire specialized clothes (Henninger *et al.*, 2019).

4.1.2 *Underpinning values*

As said before, Ecofeminism has some core values such as equality between genders, a revaluation of non-patriarchal and not pyramidal organizations, and a view of the world that

respects organic processes, holistic connections, and collaboration in the economic system (Phillips, 2020). In more detail, a Ecofeminist enterprise differentiates itself from other entrepreneurial forms for these main values (McLean, 2022):

- 1) **Freeganism:** Freeganism is an ideology that advocates for a limited engagement in the traditional economy and minimum resource use, primarily through the recovery of discarded items such as food. The name “freegan” is a combination of “vegan” and “free”. While vegans avoid purchasing, wearing, eating, and, using animal goods to oppose animal exploitation, freegans, at least in principle, try to avoid purchasing anything to criticize the system in general (Wilczak, 2020). For this reason, this project aims to use alternative methods to provide basic needs by exchanging non-animal goods outside the classical market rules to have no impact on the natural environment.
- 2) **Anti-racist, anti-colonial, and intersectional feminism:** Participants in this initiative labor tirelessly to deconstruct white supremacy and heteronormativity in community organizing, engaging working-class and LGBTQ+ artists, especially members of the racialized Romani women community redistributing to their resources.
- 3) **The relevance of art:** This project also addresses the creation of creative works on unpaid labor, precariousness, and the development of market-oriented funding methods in the artistic sector, which must be viewed as an expression of the most disadvantaged social classes.
- 4) **Equitable research:** It is difficult to approach this sort of project academically (for this reason, an interview with the project’s founder, Allie Rutherford, and the group’s members has not yet been conducted). It is difficult for them to collaborate with those in the academic sector. Indeed, even though several researchers have approached this project, the founder has always been reluctant to divulge information, as Ailie Rutherford has also described the unequal power dynamics within the world of research, particularly about art-based research, and the fact that is primarily carried out by white men who see innovation as a useful phenomenon to bring economic benefits to a specific advantaged segment of the population.

4.1.3 Alternative currencies

The People’s Bank of Govanhill is now looking at the best ways to integrate the blockchain into this project. They want to know how this can enable people to share resources across networks and satisfy the community’s needs to avoid allowing technology to further undermine people and exacerbate inequality by using the decentralized system to exchange resources and information because they are moving toward a cashless economy in which new machines have a greater impact on our lives.

The People’s Bank of Govanhill was founded because of a series of community money experiments, impromptu trades, conversations on the street, and workshops mapping interconnected local economies. They are attempting to use the blockchain to create a decentralized, open-source cryptocurrency (Howson, 2021).

4.2 Eco-feminist entrepreneurship vs neoclassical entrepreneurship

Ecofeminist entrepreneurship distinguishes itself from neoclassical entrepreneurship by four original features that determine the characteristics of these organizations. In Table 1, we propose four main dimensions to distinguish Ecofeminist entrepreneurship from neoclassical entrepreneurship that is inductively derived from the case study discussed above: values, resources stakeholders, and organizational structure.

- 1) **Values:** The first aspect that sets apart the Ecofeminist organizations above from traditional capitalist organizations is the nature of each group’s values. To give themselves a strategic advantage, capitalist firms seek out a competitive environment. Profit maximization is the purpose (Battilana *et al.*, 2018). There have been several attempts to incorporate new ideals into these business organizations. The figures of B-corps have emerged in recent years, and

social corporate responsibility has also been incorporated (Ardito *et al.*, 2021). However, Despite these aspects, these businesses are not territorialized and may operate well in any situation without considering the local environment.

The Ecofeminist groups, however, take distinct routes. Indeed, their primary goal is to promote equity and environmental justice (Fox and Alldred, 2020). From an environmental point of view, this type of organization wants to promote ethical consumption models based on reuse, free exchange of goods, and environmental protection by promoting the procurement of basic goods outside the laws of the market and not consuming animal products according to the principle of freeganism (Stephens, 2022). Instead, from a social point of view, this type of entrepreneurship aims to involve all the most disadvantaged sections of the population, giving a sense of territoriality to this type of organization, unlike capitalist enterprises (Weatherall, 2020).

- 2) **Resources:** The second dimension is represented by the resources that organizations require or exploit to survive.

Industrial capitalism financed its growth and expansion by turning conventional contracts into labor and natural resource into tradable products subjected to financial exchanges and calculations (Hickel *et al.*, 2022). Capitalistic organizations constantly reproduce this logic by attempting to common resource pools and use them to produce goods without limits (Pansera and Fressoli, 2021).

In opposition to this trend, Ecofeminist organizations want to redistribute resources to all their members without wasting natural resources and not appropriating of common resources (Mago, and Gunwal, 2019). For instance, the gift economy follows these principles because goods no longer become personal but they are common goods available to the community (Felber and Hagelberg, 2020). Furthermore, the workforce is no longer seen as a resource to be exploited and squeezed but as a bargaining chip to get goods and services rather than a profit (according to the principle of the timebank) (Stiglitz, 2019)

- 3) **Stakeholders:** Within capitalistic organizations, the focus is on business processes and the sale of products (Chang, 2016). For this reason, the main stakeholders are the people closely related to these processes. Indeed, the main stakeholders are customers, employees, shareholders, and suppliers.

Instead, in Ecofeminist organizations, the focus is on the community (Weasel, 2020). For this reason, the main stakeholders are volunteers, local communities' ethics and gender minorities, and women. Indeed, Ecofeminist organizations favor worker-owned models and horizontal managerial forms. In this type of organization, the stakeholders involved are the local associations of women, the working class, and LGBTQ+ members.

- 4) **Organizational structure:** Capitalistic Organizations are multinational corporations with traditional pyramidal structures. A private board and shareholder quotas, which could be foreign banks or institutional investors, control these organizations (Herr, 2022). At the top of these organizations, in most cases, there is a man over 60 years of age.

Instead, Ecofeminist organizations are based on a horizontal structure where all members have equal value and similar functions. These are small local organizations with a reproduction-focused pattern rather than an expansion-focused mission. Women of diverse ages and socioeconomic backgrounds constitute the managerial board of these organizations (Rose and Bartoli, 2021).

Tab. 1: Characteristics of capitalistic and Ecofeminist organizations

Characteristics	Capitalistic Organization	Ecofeminist Organization
Values	-Maximization of profit -Reproducible -Deteritorialized -Bigger is better -Global	-Equity -Environmental justice -Territorialized -Reproduction -Local
Resources	-Money -Salaried labor -Commodification -Natural resources -Market	-Time banks -Gift economy -Swapping -Wastes -Informal market
Main Stakeholders	-Customers -Employees, -Shareholders -Suppliers	-Volunteers -Local communities -Ethics and gender minorities -Women
Organizational structure	-Pyramidal -Companies -Patriacal	-Orizzontal -Cooperatives -Matriarcal

Source: our elaboration

5. Contributions

5.1 Theoretical contributions

This research brings several contributions from the theoretical standpoint.

First, it contributes to the literature on critical management showing a new organizational form birth for different purposes compared to the classical capitalist enterprises.

Second, it contributes to the literature on Ecofeminist economy and degrowth, demonstrating that new economic paths are possible.

Third, this study contributes to the literature on sustainability by demonstrating an innovation based on ethical aspects related also to environmental conservation. Within Ecofeminist entrepreneurship, ethnic, racial, and gender minorities have direct control of creating value and redistributing goods. People may exchange products locally. It enables the reduction of waste generated by the capitalistic production system (Ruder and Sanniti, 2019).

Fourth, this study contributes to the literature on social innovations. Indeed, this type of entrepreneurship has a strong social connotation and is proposed as a new model of social entrepreneurship that is based on radical principles that want to overturn the 'status quo'. According to this perspective, this study also contributes to the field of catalytic innovations (which are radical innovations from a social point of view).

Finally, this research also contributes to the field of development studies since the most disadvantaged sections of the population are involved in these organizations. Furthermore, this model can be re-proposed in developing countries as a form of social liberation for women (Mondal and Majumder, 2019).

5.2 Managerial contributions

This study provides some interesting managerial contributions, considering the potential of Ecofeminist entrepreneurship as a source of social entrepreneurship. Indeed, this research provides a tool for female Ecofeminist entrepreneurs to learn how to perform and develop radical social innovations. This principle applies to both emerging and developed countries. Ecofeminist entrepreneurship was created in poor nations intending to be a driving force for women at the

bottom of the pyramid (Mondal and Majumder, 2019). Ecofeminist organizations in industrialized nations have developed more for ethical and ideological reasons (Federici 2022).

In this light, this study helps to raise awareness of the benefits of Ecofeminist entrepreneurship in reaching sustainability goals. As a result, current EU public investment initiatives, such as Next Generation Europe (Europa.eu), might support Ecofeminist projects with significant social and environmental impacts.

Furthermore, this study illustrates that Ecofeminist entrepreneurship may provide some economic advantages. Indeed, more individuals may profit from exchanging items locally through time banks or the gift economy. Finally, governments are encouraged by this study to adopt policies that assist the formation of these organization by initially offering socio-technical niches that allow these initiatives to be developed without bureaucratic constraints and market restrictions.

6 Conclusion, limitations, and future research

We have acknowledged the usefulness of Ecofeminism in bringing about disruptive societal change in the literature. Less has been studied about the impact that Ecofeminist-inspired entrepreneurial actions can have on organizational studies and in the catalytic innovations literature. Because of these two main gaps, this paper aims to show the importance of Ecofeminism entrepreneurship in bringing a social change that would encourage society to pursue sustainable development focusing disadvantaged population groups (Abdelwahed *et al.*, 2022).

However, this study have some significant drawbacks. First, we have analyzed only one case study. Future scholars should expand these research analyzing other case studies to confirm and highlight the differences between neoliberal and Ecofeminist entrepreneurship.

Second, because it was impossible to interview the participants of this project, given the privilege as academic scholars, this study was only theoretically conducted based on prior sources and interviews.

Third, the research only considered a project that had been carried out in Scotland, ignoring the potential differences of Ecofeminist entrepreneurship in poorer nations. Therefore, researchers should implement additional studies to determine whether researchers this conceptual paper is an appropriate model in different contexts.

Fourth, this case study mainly focused on the art and textile and clothes sector. For this reasons, future studies should analyze different sectors and highlight the distinctions between this type of entrepreneurship and the capitalistic one.

Finally, the original contribution of this study is to show a first approach to eco-feminist entrepreneurship by showing how it is possible to build new organizational forms to give value to disadvantaged people safeguarding the environment by promoting new economic and consumption models.

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Exploring Humane Entrepreneurship in locally rooted tourism micro-small-medium enterprises

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Abstract

Framing of the research. *HumEnt is the combination of three dimensions that can facilitate a sustainable competitive advantage: entrepreneurship orientation (EO), human resources orientation (HR-O), and sustainability orientation (SO), particularly in micro-small and medium-sized tourism enterprises (MSMEs) that are rooted in the specificities of the territory.*

Purpose of the paper. *This paper investigates the presence of HumEnt entrepreneurial orientations in locally rooted tourism MSMEs and identifies factors that can improve engagement with the community and increase overall sustainability.*

Methodology. *A structured questionnaire was administered to a sample of 416 tourism MSMEs rooted in Italy. Descriptive statistical analysis and exploratory factor analysis were used to explore the entrepreneurial orientations.*

Results. *Results showed that all three entrepreneurial orientations are present in the sample of tourism companies examined, and six emerging underlying factors were identified: investment, inclusiveness, leadership, sustainability, innovation, and respect. These factors can help create more effective, responsible, and sustainable organizations by focusing on the human dimensions of entrepreneurship.*

Research limitations. *The study has limitations in terms of sample size and geographic focus, and the findings may not be generalizable to other regions or countries.*

Managerial implications. *The emerging factors can be used as guidelines for companies wishing to create a productive work environment that values people and is committed to long-term sustainability.*

Originality of the paper. *The study contributes to the literature on entrepreneurship by identifying six underlying factors of the HumEnt construct and by detecting the key levers that can help strengthen community engagement and improve overall sustainability, in the context of rootedness in a territory.*

Key words: *HumEnt; entrepreneurial orientation; sustainability orientation; human resources orientation; local roots; MSMEs*

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1. Introduction: locally rooted enterprises

The concept of local roots in the context of business refers to the connection and relationship between a company and its local community, including its cultural and environmental influences (Safdar, 2021). The idea is that a company that has strong ties to its local area can tap into valuable resources and create positive outcomes for both itself and the community. This connection is not only geographical, but also involves a deeper understanding of the local context and the ability to tap into local resources, networks, and knowledge (Porter and Kramer, 2002, 2019). By doing so, businesses can build capabilities that are relevant to the local environment and can be used within the internal and external organizational contexts (Keil, 2004). In this way, local roots can be seen as a source of competitive advantage for businesses also operating in a global context (Ger, 1999). In fact, studies in the field of International Business (IB) have shown the importance of considering the local context in business operations, as it can impact a company's competitiveness and sustainability (Camagni, 2002; Corò and Micelli, 2006; Dimitratos *et al.*, 2016; Baù *et al.*, 2021; Prashantham and Birkinshaw, 2022). For instance, Young, Dimitratos and Dana (2003) found that small and medium-sized enterprises (SMEs) that were able to tap into local networks and knowledge bases were able to be more competitive in international markets, despite their liabilities of newness, smallness, and foreignness. Recently, scholars and practitioners have begun to move toward hybrid approaches called "Glocal," which recognize the interplay between local and global factors. Thinking locally and acting globally has become increasingly important considering the rapidly changing business landscape fostered by digitization and globalization of markets (Svensson, 2001; Dumitrescu and Vinerean, 2010; Chung *et al.*, 2012; Festa *et al.*, 2020). In studies of international business and marketing, it has been seen that virtuous companies aim to be relevant to the local host environment and to draw on local networks and knowledge bases to build capabilities that can be employed in a company's internal and external organizational contexts, and thus aim for social sustainability (Wiig and Kolstad, 2010; Perlmutter, 2017; Taussig, 2017).

When it comes to social sustainability, local roots can play an important role in building social capital, which refers to the network of relationships, norms, and trust that exist within a community. By having strong local roots, businesses can engage with the community and build relationships based on mutual trust, respect, and understanding (Evans and Syrett, 2007). This can contribute to the social sustainability of the community by promoting social cohesion, reducing inequalities, and improving the quality of life for all members of the community (Porter and Kramer, 2002, 2019). In this regard, in recent years, the concept of humane entrepreneurship has emerged as an important framework for considering corporate social and environmental responsibilities in business orientations. Humane entrepreneurship recognizes that businesses must balance their economic goals with the well-being of their stakeholders, including employees, customers, and the environment (Parente *et al.*, 2018; Kim *et al.*, 2018; Parente *et al.*, 2021; Kim *et al.*, 2021; Vesci *et al.*, 2022). This perspective is particularly relevant for businesses with local roots, as they are often more closely linked to the communities and territories in which they operate and have a greater impact on the social and environmental well-being of those areas. By considering both the local rootedness of businesses and the concept of human entrepreneurship, we can better understand how businesses can operate sustainably and responsibly and how they can leverage their ties to the environment and the land to build social capital and co-create value for all stakeholders (Troisi *et al.*, 2018; Ciasullo *et al.*, 2016; Botti *et al.*, 2017; Barile *et al.*, 2017).

Tourism businesses are considered a clear example of enterprises that are rooted in the local area and take a Glocal approach because they operate in a way that is both locally relevant and globally competitive (Chang *et al.*, 1996; Porter, 2000). Tourism businesses rely heavily on the unique cultural, historical, and natural assets of the local area, which they use to attract tourists from all over the world. This means that they are rooted in the local context, as they seek to preserve and promote the local heritage and way of life. At the same time, tourism businesses also operate on a global scale, seeking to attract visitors from all over the world and to compete with other destinations in terms of quality, innovation, and price (Milne and Ateljevic, 2001; Wood, 2002;

Mayer and Know, 2006; Tani and Papaluca, 2015; Gazzola *et al.*, 2018; Troisi *et al.*, 2019b). This requires a Glocal approach, as they must balance their global aspirations with their local roots and commitments (Salazar, 2005; 2006; 2010; Bom, 2012). To do this, tourism businesses must develop a deep understanding of both the local context and the global tourism market, as well as the interplay between them. Overall, the connection between local roots, a Glocal approach, and humane entrepreneurship is clear in the case of tourism businesses.

Similarly, micro-enterprises and family businesses can be another example of local roots. These types of businesses often have strong ties to the local community, including close relationships with customers, suppliers, and employees. They are also typically rooted in a specific region or cultural context, which shapes their business practices, values, and approach to doing business. As a result, these enterprises often have a deep understanding of the local context and are well positioned to respond to local market needs and requirements (Gallo and Sveen, 1991; Baù *et al.*, 2019). Additionally, the ownership structure of these businesses, which is often based on family or personal relationships, can also play a role in anchoring them to the local area and building strong relationships with local stakeholders while still moving towards digitization accelerated by the need caused by Covid-19 (Fineman, 2010; Lenz, 2021; Niang *et al.*, 2022; Troisi *et al.*, 2022).

From the search done in the literature, to the best of the authors' knowledge, there were no studies that could link "Human* Entrepreneur*" and "Local Roots" in a direct way. The only ones in the literature dealing with entrepreneurship orientations and local roots in a narrow sense are in the field of International Business and Management presenting research on rural areas in disadvantaged countries. Moreover, Parente *et al.*, (2021) have outlined some steps in developing a scale for measuring HumEnt and no one has validated it yet. Instead, regarding the individual (hypothesized) components of HumEnt, namely, Entrepreneurial Orientation (EO), Human Resources Orientation (HR-O) and Sustainability Orientation (SO) in no case have they been studied in the context of tourism or Micro-Small and Medium Enterprises (MSMEs).

Building on this gap, Humane Entrepreneurship (HumEnt) is proposed as a theoretical background to analyze the practical entrepreneurial priorities of locally rooted firms. The exploration of this concept enhances the exploration of the human component as one of the main drivers for the proper application of a strategic orientation that can improve engagement with the target community for local or want-to-be-rooted businesses. The aim of the work then is to test through statistical descriptive analysis and exploratory factor analysis (EFA) whether entrepreneurial orientations can be found in locally rooted tourism MSMEs and finally ascertain whether the HumEnt construct emerges.

To try to fill the gap in the literature and achieve the goal, we proceeded as follows: in section two we outlined the theoretical background of HumEnt through its three orientations and set out the research hypotheses (2); in section three we detailed the methodology by describing the sample, the data collection and analysis techniques (3); in the next section we set out the results (4) and the discussions with also the implications and limitations close the paper (5).

2. Theoretical background and research hypothesis

2.1 Humane entrepreneurship: the human side of doing business

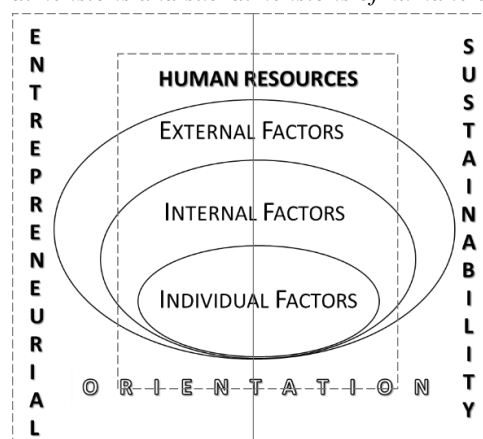
In contemporary complex markets, characterized by digitalization, the relevance of intangibilities and the social purposes of businesses, new models of entrepreneurship are proposed.

Traditionally, the role of entrepreneurs has been associated with two main tasks: the starting of new businesses and/or the exploitation of new opportunities (Covin and Slevin 1989; 1991). Over the course of time, the attitude and the strategic posture of entrepreneurs have been explored and adapted to different focuses emerged from markets and society, by emphasizing in the different conceptualizations the strict relationship between entrepreneurship and the development of innovation. The concept of entrepreneurship has been redefined in the light of the advent of new

technologies (Carayannis and Formica, 2008; Garud *et al.*, 2008) through the introduction of “digital entrepreneurship” (Nambisan, 2017; Richter *et al.*, 2017), which emphasizes the key role of digitalization in the reshaping of entrepreneurial pursuits and in the reduction of uncertainty and complexity. According to literature, there are two different faces of entrepreneurship, two opposite postures (Salavou *et al.*, 2005): 1) passive entrepreneurship (technology and ICTs-enabled); 2) active entrepreneurship (driven by individuals’ agency). Active entrepreneurs employ technologies strategically by using them dynamically thanks to the application of their active skills and capabilities. This attitude can enable the development of innovation thanks to a more aggressive orientation characterized by the willingness to undertake risks and to boost proactiveness, which is considered one of the key enablers of innovation (Avlonitis and Salavou, 2007). For this reason, the different weights of ICTs- enhanced organizational structures and of the individual attributes (behaviour, attitude, human skills) that manage, harmonize, and create value in these structures should be assessed. Moreover, research on the technological side of entrepreneurship focuses mainly on the investigation of ability to catch opportunities for new business, rather than on the identification of the skills and capabilities of people to develop innovation, to create and distribute value to the internal and external stakeholders for the development of satisfaction and of mutual benefits for markets, to job system, to the entire territory.

Humane entrepreneurship (HumEnt) was then proposed as an expanded vision with a human-centered logic to shift the focus to inclusive, socially oriented and sustainable purposes. Human entrepreneurship introduces a new kind of strategic posture that aims to respond to sustainability needs by revising the traditional model, mindset and attitude of entrepreneurs in light of new social needs and the increasing relevance of human resources, skills and people’s engagement in entrepreneurial processes (Parente *et al.* 2018). HumEnt can be defined as the research for human’s growth as key levers for the attainment of new opportunities for innovation and sustainability (Kim *et al.*, 2016). People are considered as strategic resources for the proactive research for innovation opportunities and for the envisioning of future markets through capability development (Bae *et al.*, 2018). According to Kim *et al.* (2018) and Parente *et al.* (2018), HumEnt is the synergistic combination of three dimensions (synthesized in Figure 2) that can foster the attainment of sustainable competitive advantage: 1) entrepreneurial orientation; 2) sustainable orientation; 3) human resources orientation. Each dimension can be sub-divided into 1) internal factors (corporate culture and organizational structure, the inner sphere of a company); 2) external (elements and forces external to firm’s boundaries that can affect businesses life); 3) individual factors (the set of values that entrepreneurs employ to establish strategic foundations and that becomes shared beliefs in the organization). Employees and human resources should develop a shared vision that inspires the research for innovative actions (Parente *et al.*, 2020) to achieve strategic goals, from mission-vision to a mind-set based on sharing and cooperation to pursue changes thanks to the diffusion of a risk-taking attitude and a creative thinking.

Fig. 1: The dimensions and sub-dimensions of humane entrepreneurship



Source: our elaboration

2.2 Entrepreneurial Orientation (EO)

Entrepreneurial Orientation (EO) refers to the complex processes and practices of strategic decisions that can determine new entry (Lumpkin and Dess, 1996), to the abilities to take risk and exploit new entrepreneurial opportunities (Zahra and Neubam, 1998). Over time, different conceptualizations have been proposed, but an accepted definition has not been introduced yet.

The classic studies on strategic management define EO as the ability to search for new opportunities (Mintzberg, 1973), as a management style that allows firms at becoming entrepreneurial, namely innovative, risk-taking (Covin and Slevin, 1998), forward-looking and proactive (Lumpkin and Dess, 2001). Empirical research on this issue introduced some measurement scales which observe EO as a unitary or unidimensional construct (Miller, 1983; Covin and Slevin, 1989; Covin and Lumpkin, 2011; Anderson *et al.*, 2015) which identifies the attributes of top management strategy in organizations or business units: innovativeness, risk taking behaviours and proactiveness. As a multidimensional construct, EO is also conceptualized as the manifestation of entrepreneurship as an organizational attribute with the dimensional antecedents to new entry being risk taking, innovativeness, proactiveness, autonomy, and competitive aggressiveness (Lumpkin and Dess, 1996). The two perspectives cannot be considered opposite, but as complementary approaches that focus on different phenomena: the first searches for the commonalities in entrepreneurial firms, whereas the second detects the differences between entrepreneurial and non-entrepreneurial firms.

However, despite the proposition of different measurement scales, not all the elements of EO as a firm-level construct can be translated to the individual level (Covin and Wales, 2019). Moreover, innovativeness is composed of different shades of meaning, can be influenced by different antecedents, and can give birth to different innovative outcomes that go beyond new product/service introduction (Covin and Wales, 2012). For this reason, the conceptualization of EO needs to be integrated with other managerial aspects (such as human resources management) and with a deeper analysis of how entrepreneurial orientation can be translated at an individual level (in terms of resources, skills, and capabilities). Referred to the unified vision of HumEnt in this study, this research question is advanced:

RQ1. Is entrepreneurial orientation (EO) existent in locally rooted micro-small and medium-sized enterprises?

2.3 Sustainability Orientation (SO)

Sustainability orientation (SO) is a general mind-set that companies should adopt to be aligned with contemporary governments and market's requirements to address social challenges, satisfy social needs, and challenge environmental concerns (Kim *et al.*, 2016), which in the era of prosumption and social consumption cannot be ignored. Sustainability and Corporate social responsibility (CSR, Carroll, 1979) are two mantras in contemporary business strategies which lead organization to pursue societal evolution towards a more equitable and wealthier world in which natural environment and cultural heritage are preserved for future generations (Dyllick and Hockerts, 2002). Generally, the definition of sustainability, in line with the Triple Bottom Line model (TBL, Elkington, 1999), encompasses three dimensions: 1) social, 2) environmental, 3) economic. In extant research on entrepreneurship, some scholars focus on the environmental aspect (Schaltegger, 2002), whereas others analyze the broader social aspect of sustainability (Lumpkin *et al.*, 2013; Prahalad and Hammond, 2002) and observe the most proper strategies to harmonize business and community's interests. As Attig and Brockman (2017) state, social sustainability and CSR can be as mentioned above linked to the concept of local roots as engagement between the firm and its specific context as the reference environment in which stakeholders cohabit. This concept has also emerged several times in the literature about family businesses (Baù *et al.*, 2021). In conclusion, Kuckertz and Wagner (2010) found that concern for ethical, social, and environmental issues is more likely to translate into entrepreneurial intention and subsequent

potential entrepreneurial behavior especially for less experienced students who want to enter the business world. The scholars clearly measured the degree of sustainability orientation through 6 sub-items. The second research question is hereby proposed to accommodate HumEnt's unified view:

RQ2. Is sustainable orientation (SO) existent in locally rooted micro-small and medium-sized enterprises?

2.4 Human-Resources Orientation (HR-O)

Human resources orientation (HR-O) concerns the engagement, empowerment, and the general attention to employees, to internal and external human resources that should be managed to foster the detection of new opportunities. In the area of organizational capital influenced by managerial but also human culture, Kim *et al.* (2018) theorize two dimensions of capital: human and social. The social one includes the dimensions of Empathy (Davis, 1983), which is divided into cognitive (Hogan, 1996) and emotional (Mehrabian and Norman Epstein, 1972) as the first connection between leaders and people in the company and then to follow equity and empowerment as well as for human capital, on the other hand, there is the last dimension of enablement (Kim *et al.*, 2018). Thanks to the enhancement of synergy and empathy between human resources and top management, not only people can be satisfied and motivated- by enhancing performance-, but they can exchange resources dynamically to create new knowledge and enable the development of innovation. Participation, training and skills development, information sharing are the key factors employed to increase human resources satisfaction (Kim *et al.*, 2018; Vesci *et al.*, 2022). Kim *et al.* in their studies always theoretically propose the HR-O orientation and bring out an item description but there have been no studies in which the construct has been empirically measured. Since there is no scale for the HR-O construct, it has not been scientifically proven so it can be the subject of separate analyses for individual items. Therefore, we advanced the third and final research question in the same way as the others:

RQ3. Is Human Resources Orientation (HR-O) existent in locally rooted micro-small and medium-sized enterprises?

3. Methodology

3.1 Data collection and sampling

This study aimed to investigate the HumEnt of micro-small and medium-sized enterprises (MSMEs) in the tourism sector that are rooted in the territory. Based on the theory explained above and trying to answer the established research questions, a questionnaire consisting of 43 questions was developed to collect the data, including the EO (9), HR-O (20), and SO (6) constructs with 7-point likert scales. Additionally, questions were included to describe the company and its size (5) and the respondents (3). Regarding business descriptions, a distinction was made based on the classification of tourism businesses by Gee *et al.* (1984) and Ottenbcher *et al.* (2009), who divide them into: Accommodation (Hotels, Camping, etc.); Food & Beverage (Restaurants, bars, etc.); Tour Operators, Travel Agencies, Transportation and Entertainment & Leisure. Then they were asked in which municipality they were located and the company's age. In relation to the size of the company, European legislation was used, more specifically European Commission Recommendation 2003/361/EC of 6 May 2003 concerning the 'definition of micro, small and medium-sized enterprises' (MSMEs). The questionnaire was administered to Italian MSMEs by contacting them via Facebook groups and through direct e-mail to reach larger companies from December 2022 and February 2023. The target group choice is justified by Italy's reputation as a tourist country and its high percentage of rooted MSMEs. The use of Facebook groups and direct e-mail contact is a common and effective method of administering questionnaires. A total of 416 responses out of a

potential 20,000 companies were received from Facebook group participants and direct e-mail contacts. The data were then processed in Microsoft Excel to import them correctly into R-Studio. Using the R-Studio console using R (version 4.2.2), it was first conducted a descriptive statistical analysis and then an exploratory factor analysis (EFA). Descriptive analysis was used to summarize and describe the main characteristics of the variables in the dataset. A descriptive analysis was used to calculate measures of central tendency, variability and distribution for each of the variables included in the questionnaire (Mishra *et al.*, 2019). This was done to ensure that the data collected was reliable and valid, and to identify any potential issues or patterns in the data. After conducting the descriptive analysis, the EFA was used to explore the underlying factors of the dataset. EFA is a statistical technique that identifies the underlying factors or dimensions that explain the correlation among a set of variables (Suhr, 2006). In addition, EFA was used to identify common themes or constructs among the variables, which assisted in answering the research questions and guiding further analysis (Yong and Pearce, 2013). Limitations and potential biases in the methodology are acknowledged, including the potential lack of generalizability of the results due to the low response rate (Sills and Song, 2002).

3.2 Descriptive Analysis

Descriptive statistical analysis was carried out using R-Studio (R Core Team, 2022). For that purpose, it was necessary to check whether there were any missing data or any other problems using ‘skimr’ package (Baraldi and Enders, 2010; Waring *et al.*, 2020). The sample consists of 416 observations with 43 variables and no missing data. As can be seen from Table 1, most of the tourism companies that responded are from the Hospitality sector, and mostly Hotels.

Tab. 1: Industry

<i>Industry</i>	<i>Frequency</i>	<i>% of total</i>	<i>% cumulated</i>
Accommodation (Hotels)	168	40.4	40.4
Accommodation (Camping)	36	8.7	49
Accommodation (Others)	74	17.8	66.8
Food & Beverage	15	3.6	70.4
Tour Operators	25	6.0	76.4
Travel agencies	27	6.5	82.9
Transports	20	4.8	87.7
Entertainment & Leisure	51	12.3	100.00

The Italian municipalities where the enterprises were located were identified and placed in 3 geographical areas (North, Centre and South Italy). It was found that most of the responding enterprises are in Southern Italy (47.4%), followed by those in the Centre (32%) and those in the North (20.7%). Regarding the years of establishment of the company, it was noted that most of them are over 20 years old (53.1%), followed by those between 11 and 15 years (21.9%), then 16 to 20 years (10.1%), less than 5 years (8.7%) and finally 5 to 10 years (6.3%). The descriptive analysis then revealed that the responding companies were mostly micro enterprises as 61.3% regularly have between 2 and 10 employees per year but companies with a turnover of less than 2 million are 67.1% as shown in table 2. In second place of the respondents are small enterprises with 11-50 employees (33.2%) and a turnover between 3-10 million (16.1%). The smallest respondents are medium-sized enterprises with between 51 and 250 employees (5.5%) but with a turnover between 11-50 million (16.8%). It should be noted that for the European Commission, only one requirement is needed to be defined as a micro or small and medium-sized enterprise. Therefore, medium-sized enterprises make-up 16.8% of the sample.

Tab. 2: Responding sample

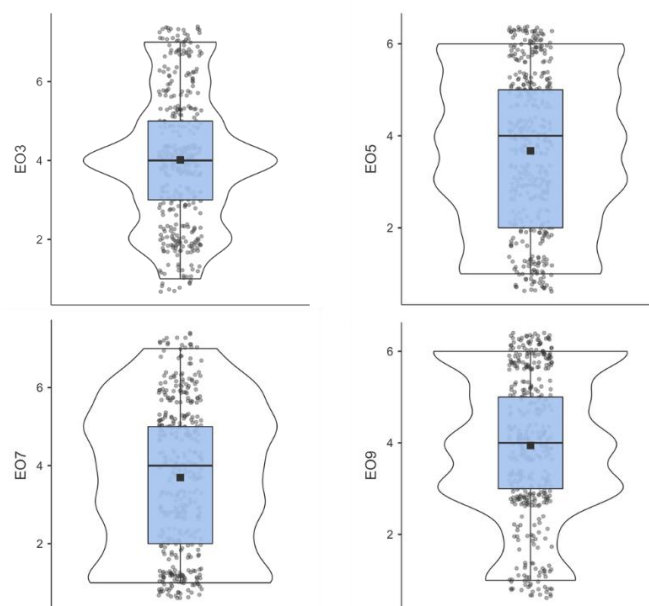
<i>Company size</i>	<i>Criteria</i>	<i>Frequency</i>	<i>% of total</i>
Micro-enterprises	2-10 employees	255	61.3
	0-2 Mln EUR	279	67.1
Small-enterprises	11-50 employees	138	33.2
	2-10 Mln EUR	67	16.1
Medium-enterprises	51-250 employees	23	5.5
	10-50 Mln EUR	70	16.8

Looking more closely at the respondents to the questionnaire, who were entrepreneurs or managers of the MSMEs targeted in the study, they were predominantly male (68.3%), as was to be expected, against 27.2% female and 4.6% who did not specify gender. The entrepreneurs and managers who responded also turned out to be relatively young. This explains the fact that many others did not respond. More than half (55.5%) stated that they were within the age of 48 and even 31% were within the age of 36. Only 6.2% said they were over 57 years old. In conclusion, it was also possible to analyse the level of education and it emerged that 46.4% of the sample had attained a high school diploma, 14.2% a bachelor's degree and, surprisingly, 39.4% a master's or post-graduate degree. After that, a descriptive factor analysis of the EO, HR-O and SO constructs followed to first see if they emerged in the sample and then the correlation matrix and finally the exploratory factor analysis (EFA) were performed. The findings are clearly set out in the next section.

4. Findings

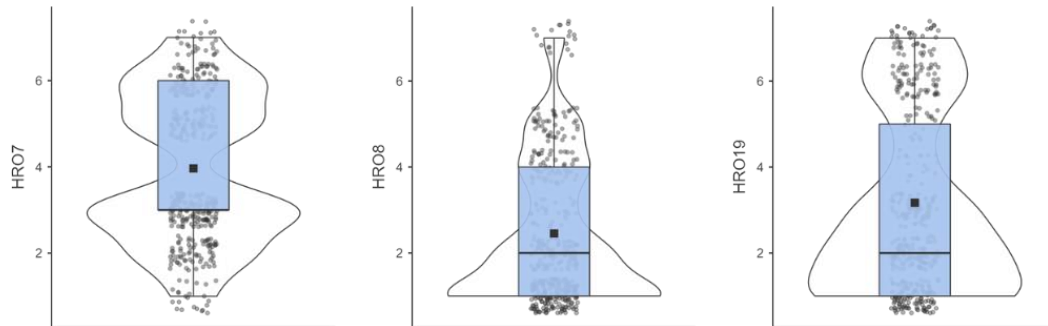
The descriptive statistical analysis of the variables done beforehand to see if the EO, HR-O and SO orientations were present, showed that the reference sample has a good average score for each of the constructs. In particular, the entrepreneurial orientation is lower than the other two. It is evident from Figure 1 that, about the EO, the question on drastic changes (EO3), more than half of the participants (66.8%) answered with a score from 1 to 4, with a predominance of neutral responses. The question 'I prefer to adopt a very competitive position, trying to cancel out competitors' (EO5) was also answered predominantly (64.2%) with lower scores. Then it emerged that the entrepreneurs and managers in the sample, as was expected, were mostly (61.1% and 61.3%) risk-averse (EO7) and audacious to seize opportunities (EO9).

Fig. 1: Critical issues of EO



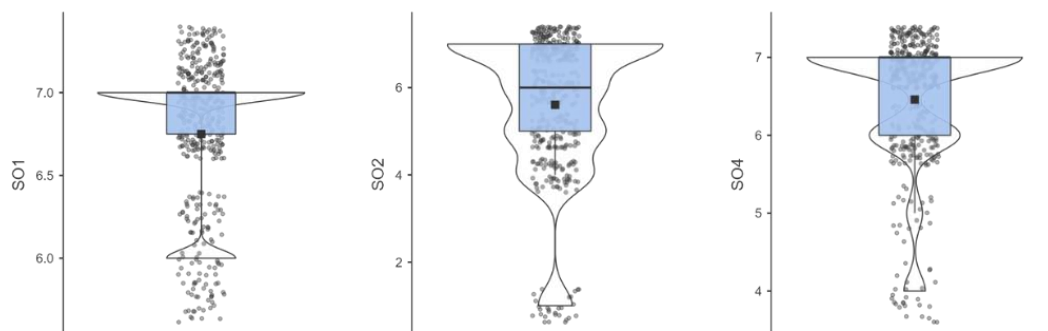
On the other hand, regarding the HR-O construct, as can be seen from Fig. 2, the data showed that companies do not have equal numbers of employees between Italians and foreigners (HRO7) and only 6.3% stated that they do. Furthermore, concerning to protected categories (HRO8), only 4.3% stated that they hire employees with disabilities. Finally, only 10.1% declared that they include all employees in company decisions regardless of discrimination.

Fig. 2: Critical issues of HR-O



In conclusion, the factor that is best perceived by the sample of companies in this study is that of Sustainability (SO), which is precisely social and linked to the territory in which the companies operate, demonstrating how rooted these companies really are. In fact, in Figure 3 you can see the items with the most successful responses. Seventy-five per cent of the respondents strongly agreed that small tourism enterprises should take a leading role in protecting the territory in which they operate (SO1). Continuing with the observation of the results, 78,8% of the companies quietly and strongly agreed with the fact that companies oriented towards territorial protection have advantages in recruiting and retaining qualified employees (SO2). Finally, 86.3% agreed that entrepreneurs should assume greater corporate social responsibility (SO4).

Fig. 3: The key points of SO



Following the descriptive analysis, we constructed the correlation matrix between the variables of the EO, HR-O and SO constructs by means of R-Studio. The matrix did not show any discrepancies as depicted in Fig. 4 (Steiger, 1980). These results and preliminary analyses have already made it possible to answer the research questions posed at the beginning of the paper and also allowed to continue the investigation and conduct an exploratory factor analysis (EFA) to look into the relationships between the observed variables and identify the underlying factors explaining the variation in the data (Yong and Pearce, 2013).

The method of minimum residual extraction in combination with varimax rotation based on parallel analysis was used to perform the EFA (Hayton *et al.*, 2004). This rotation initially provided 12 factors but only with the training of the instrument based on the sampling fit measure (KMO) and the removal of the items that did not explain any factor (Worthington and Whittaker, 2006) produced 6 factors as can be seen in Fig. 2 with a good factorial loading but presenting within them unordered items of the three constructs EO, HR-O and SO.

Fig. 2: Loading factors

	Factor						Uniqueness
	1	2	3	4	5	6	
EO6	0.923						0.11935
HRO16	0.791						0.34330
HRO17	0.598						0.63937
HRO8		0.990					0.00221
HRO19		0.771					0.37832
EO8			0.925				0.14220
HRO18			0.784				0.37877
SO6				0.994			0.00457
SO5				0.534			0.70958
EO4					0.995		0.00473
EO1					0.405		0.82953
HRO6						0.744	0.43896
HRO14						0.594	0.64552

As for the model fit measures, an RMSEA of 0.00, with a TLI of 1.01, the BIC of -78.0, the chi-square of 12.4 with a degree of freedom (df) of 15 and p-value at 0.6 demonstrate the goodness of fit of the proposed factorial model to the observed data. In particular, the RMSEA value is an indicator of the discrepancy between the model and the data, and values below 0.05 indicate a good fit (Sharma *et al.*, 2005). A TLI value of 1.01 indicates that the model fits the data well compared to a null base model, where there are no relationships between the variables (Sahoo, 2019). BIC of -78.0 indicates that the proposed model has a good balance between fit and model complexity (Preacher *et al.*, 2013). Finally, the chi-square value of 12.4 with a df of 15 and a p-value of 0.6 suggests that the model fits the data well, as the p-value indicates a good fit when it is above 0.05 (Costello and Osborne, 2005; Luo *et al.*, 2019). Finally, the Bartlett test of sphericity was conducted to check whether the observed variables are intercorrelated with each other and whether the proposed factorial model is appropriate for the data (Yong and Pearce, 2013). The test shown in fig. 3 gave these results: Chi-square of 1584 is very high, suggesting that the variables are not independent of each other (Spector, 1986). Furthermore, the p-value is less than 0.001, thus indicating that the difference between the observed data and the proposed model is significant (Jamil *et al.*, 2014).

Fig. 3: Bartlett's sphericity test

χ^2	df	p
1584	78	< .001

5. Discussion

The exploratory factor analysis allowed us to uncover the underlying relationships between the items, and we obtained that the model explained 6 factors and proposed questions for the HR-O construct from the suggestions of Kim *et al.* (2019). By analysing and interpreting the items constituting the factors, we can try to find a common labelling that can explain these couplings (Williams *et al.*, 2010).

The first emerging factor consists of EO6 (“My company is very often the first to introduce new products/services and technologies”), HRO16 (“We offer internal continuous training to employees”) and HRO17 (“We encourage continuous training of employees”). The common sentiment that sums up all three statements is ‘investment’. Each statement highlights a different type of investment: investment in innovation and new technologies, in internal training programmes and in continuous learning and employee development.

The second emerging factor is composed by HRO8 (“In the company we tend to hire workers from protected categories”) and HRO19 (“We also try to involve our employees in company decisions”). The common feeling that summarizes both statements is “inclusivity”. Each statement highlights a different aspect of inclusivity: hiring workers from protected categories in the first statement and involving employees in company decisions in the second statement. Both ideas promote a sense of belonging, acceptance, and equal opportunity for all employees within the company.

The third emerging factor is EO8 (“Given the nature of the environment, achieving the company’s goals requires courage and foresight”) and HRO18 (“We try to involve our employees in the most important tasks”). The common feeling that summarizes both statements is “leadership”. Both statements emphasize the importance of leadership, courage, and long-term vision to achieve the company’s goals in a challenging environment. In addition, the second statement highlights the importance of involving employees in important tasks, which can foster a sense of responsibility and ownership among them. Together, these ideas promote a culture of leadership and active participation among both managers and employees.

The fourth emerging factor is the combination of SO6 (“I think environmental problems are one of the biggest challenges for our society”) and SO5 (“I believe that entrepreneurs and companies must take more social responsibility”). The common feeling that summarizes both statements is “sustainability”. Both statements emphasize the importance of addressing environmental challenges and the need for companies to take a more responsible approach to social and environmental issues. This suggests a commitment to sustainability and the belief that companies have a role to play in promoting a more sustainable future.

The fifth emerging factor consists in EO1 (“I prefer to put a lot of emphasis on research & development of new products/services and technological solutions rather than working on proven products/services”) and EO4 (“I prefer to arrive before others by bringing innovations to the market”). The common feeling that summarizes both statements is “innovation”. Both statements highlight the importance of innovation, research and development, and the introduction of new products and solutions to remain competitive and succeed in the market. This suggests that the company values creativity, forward-thinking, and invests resources in innovative practices.

The sixth emerging factor is a combination of HRO6 (“In the company the number of men is equal to the number of women”) and HRO14 (“I believe that my employees are adept at making decisions pertaining to their tasks”). The common feeling that summarizes both statements is “respect”. Respect for the abilities and decision-making skills of the employees in the first statement, and respect for equality and diversity in the second statement.

In conclusion, it can be asserted that in the sample of tourist MSMEs with the characteristics described above the presence of three orientations of HumEnt (EO, HR-O and SO) measured in literature is confirmed. The results of EFA shows that the items underlying the constructs merged and explained 6 factors which are:

- *Investment*

- *Inclusivity*
- *Leadership*
- *Sustainability*
- *Innovation*
- *Respect*

The emerging factors listed above, which include investment in employee training and development, inclusion and diversity, strong leadership and sharp vision, social and environmental sustainability, innovation and respect for people, represent a significant shift from the traditional understanding of entrepreneurship as solely based on economic factors (Marin *et al.*, 2015; Ciasullo *et al.*, 2017; Ciasullo *et al.*, 2019; Cardoso, 2020). A focus on the human dimensions of entrepreneurship can help create more effective, accountable and sustainable decision-making organisations and represents an important perspective for future entrepreneurial studies and practice (Polese *et al.*, 2016; Kim *et al.*, 2021; Parente *et al.*, 2021; Parente and Kim, 2021). Moreover, these factors can be used as guidelines for companies wishing to create a healthy and productive work environment that values people and is committed to long-term sustainability.

6. Concluding remarks

This paper aims at analysing the practical entrepreneurial priorities of locally rooted enterprises. The exploration of this concept emphasises the exploration of the human component as one of the main drivers for the proper application of a strategic orientation that can improve engagement with the community of reference for local or entrenched enterprises (Attig and Brockman, 2017; Visvizi *et al.*, 2022). Eventually, through descriptive statistical analysis and exploratory factor analysis (EFA), entrepreneurial orientations in locally rooted tourism SMEs were explored and it was finally evaluated whether the HumEnt construct emerges. Through the descriptive analysis it was already possible to answer the research questions and in fact we can say that all three orientations are present in the sample of tourism companies we studied, and we saw that EO is at a lower level than HR-O and SO. On the other hand, Sustainability Orientation understood as social sustainability linked to the territory as it was intended is very dominant in the perception and answers of entrepreneurs and managers as has also emerged in other works (Troisi *et al.*, 2019a). Another interesting result, which represents an advance over the HumEnt studies, is that the exploratory factor analysis allowed us to uncover the underlying relationships between the items, and we obtained that the model explained 6 factors and proposed questions for the HR-O construct from the suggestions of Kim *et al.* (2019). By analysing and interpreting the items constituting the factors, we can try to find a common labelling that can explain these couplings (Williams *et al.*, 2010).

6.1 Implications and limitations

The implications of the HumEnt theory for the scientific community are manifold. Firstly, the theory emphasizes the importance of considering the human aspects of entrepreneurship in research, rather than just assessing the economic aspects. Furthermore, the theory highlights the need to develop innovative research tools and methods to measure and evaluate the human aspects of entrepreneurship, which can be more difficult to quantify than other factors.

For practitioners, HumEnt theory offers important implications for entrepreneurial practice. Specifically, a focus on human factors can help companies create more inclusive, sustainable, and productive work environments. This could include, for example, adopting diversity and inclusion policies, investing in employee training and development, creating a strong vision and leadership, and promoting sustainable environmental and societal practices. Moreover, taking these factors into account could help create more competitive companies that can make a difference in the marketplace and be more respected by the community.

This work is not without limitations, since firstly it considers a small part of the types of enterprises, these being only tourist MSMEs and rooted in a territory. Other limitations may include a low response rate to the questionnaire by the tourism enterprises involved, which could influence the generalisability of the results. Furthermore, the data were collected only in Italy, which could influence the representativeness of the results for other countries. Furthermore, the sampling was not completely random, which could influence the representativeness of the sample and the possibility to generalise the results. Finally, the self-reported nature of participants' answers could introduce a potential risk of measurement error and data bias.

6.2 Future research

There are several possible future research directions that could be considered based on the results of this study. New research could be conducted, first of all with more responses and with other types of enterprises and perhaps making a cross-cultural comparison. In addition, the relationship between emerging factors and traditional dimensions of entrepreneurship, such as innovation, value creation and business performance, could be explored. It might be interesting to better understand how the integration of emerging factors into business strategies and practices affects these dimensions and how this relationship varies according to context. It might also be interesting to identify new measures and indicators to assess the integration of emerging factors into business activity. Especially, it might be useful to develop specific indicators for each of the emerging factors to assess their impact on business performance and employee well-being. Analyses of the internal dynamics of organisations adopting emerging factors in their entrepreneurial activity could be performed. The way in which these emerging factors influence organisational culture, corporate climate and relations between employees and between employees and management could be explored by conducting exploratory and qualitative studies. In addition, an exploration of the relationships between emerging factors and social entrepreneurship and how the integration of these factors can foster the creation of social enterprises that, in addition to generating profit, are engaged in creating value for society and solving social problems could be useful. Finally, it might be useful to better understand the barriers and facilitating factors to the adoption of these emerging factors so that entrepreneurs and organisations can be better supported in integrating these innovative practices into their business activities.

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Local root and university link: digitalisation and SDGs. A literature Review

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Abstract

Framing of the research. *Successful implementation of solutions to achieve the United Nations Sustainable Development Goals (SDGs) increasingly depends on the joint efforts of a diverse group of stakeholders and the adoption of innovative systems. Therefore, the paper explores how the link between local roots and universities enables them to address the challenges related to the SDGs.*

Purpose of the paper. *This paper presents the state of the art and emerging issues in the literature on the linkage of local roots and universities in promoting digitalization to achieve SDGs. The purpose is to provide a comprehensive picture on topics under consideration, highlighting established, emerging and niche topics.*

Methodology. *A systematic review of the literature published between 2004 and 2023 was conducted using bibliometric techniques, enriched by the study of papers emerged from bibliometric analysis.*

Results. *Scientific production on the topic is limited; we found mainly articles dealing with: how civil society engages and acts in sustainability transformations, the adoption of new technologies within geographically defined “local” communities, and the importance of government support and policy frameworks in promoting the adoption of sustainable practices*

Research limitations. *Future research could compare the results of other databases with those proposed by our study by extending our protocol to obtain better results.*

Managerial implications. *Because the topic analyzed emerges as still underexplored in the literature, this paper suggests the need for the university to take a leading role in enhancing local root in order to achieve SDGs.*

Originality of the paper. *This paper is one of the first studies that attempts to systematize the literature on the university’s connection with local roots in promoting SDGs.*

Key words: *local root; SdGs; university; bibliometric; digitalisation. literature review.*

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1. Introduction

Sustainable development is a major issue in many areas, including economics, politics, environment, and society. There are many definitions of sustainable development, but in general it refers to the ability to meet the needs of current generations without compromising the ability of future generations to meet their own needs (United Nations General Assembly, 1987).

Studies on the topic focus on multiple aspects of the problem by seeking innovative and sustainable solutions, including: the environmental impact of human activities (Frank and Engelke, 2001; Gosling and Peters, 2015; Li *et al.*, 2020); sustainable consumption and production (Geels *et al.* 2015; Govindan, 2018; Bengtsson *et al.*, 2018); climate change and its causes/consequences (Rangwala and Miller, 2012; Trenberth *et al.*, 2015; Malhi *et al.*, 2021); and the role of public policies in promoting sustainability (O’Faircheallaigh, 2010; Belletti *et al.* 2017; Mills *et al.*, 2022).

In this regard, SDGs represent pathways of transformation that aim to lead to a more equal global society and a sustainable planet. The SDGs are a set of 17 goals adopted by the United Nations in 2015 to guide global efforts to achieve sustainable development by 2030. These goals address a range of issues, including poverty, inequality, climate change and environmental degradation, and are intended to be implemented at local, national and international levels. Therefore, one of the main challenges is to engage government, business, nongovernmental organizations, civil society, and academia to work together for effective implementation of SDGs initiatives (Lavery 2018).

Universities, as actors involved in education, research, and innovation, can play a crucial role: by bringing together a diverse group of societal actors to take action and make an impact; by conducting research that leads to the development of new technologies and innovations; and by implementing high-quality education and training programs that provide students the necessary skills and knowledge to contribute to the SDGs (Sedlacek 2013; Ceulemans *et al.*, 2015; Lozano *et al.*, 2015; Mori Junior *et al.*, 2018; Leal Filho *et al.* 2019; Izzo *et al.*, 2022).

At the same time, the need to involve citizens in changing energy and consumption systems and the importance of local roots that emphasizes on how people create and shape places (Sternad *et al.*, 2017) have been highlighted as a key concern also in both recent energy research and energy policies. In fact, community action has become increasingly central to debates about the transition to sustainability and growing interest exists to understand how local, bottom-up action can contribute towards addressing this global issue (e.g., Barr and Devine-Wright 2012, Aiken 2016, 2018; Heiskanen *et al.*, 2018; MacArthur and Hoicka, 2018; Hasanov and Zuidema, 2022; Feola *et al.* 2023). Central to the debate are initiatives that have been conceptualized as grassroots innovations (Seyfang and Smith, 2007), a bottom-up approach of developing new solutions to sustainability challenges, which involves combine the creativity and knowledge of individuals, communities, and organizations; in other words, civil society-led initiatives that are often driven by social good rather than economic motives (Izzo *et al.*, 2023).

Another focus is on understanding the context in which sustainability frameworks are developed and implemented to assess their effectiveness (Mazutis *et al.*, 2021). A significant portion of this research has focused on urban policies and politic governance (e.g., Bulkeley and Kern, 2006; Moloney *et al.*, 2010; Burch, 2010; MacArthur, 2017; Devine-Wright *et al.* 2022).

Actors at the local level can provide an attractive potential alternative avenue for policy change and are increasingly engaged in driving the necessary energy transformations. From the policy perspective, there are still many aspects to be studied: such as appropriate institutional mechanisms that can realize benefits both in reducing emissions and in providing reliable and affordable energy services, community engagement techniques, as well as identifying and realizing citizens’ expectations of their engagement. How to design and govern the convergence of global aspirations, such as those of the SDGs, and existing bottom-up, community-driven strategies is a second crucial issue yet to be explored.

Therefore, we provide a research agenda to support both academics and policy makers and practitioners to reprioritize the design and implementation of grassroots sustainability initiatives

that involve the community. With the dual goals of filling gaps in the literature and guiding future research, we opted for a systematic literature review using bibliometric techniques (Tranfield *et al.*, 2003) to establish not only the state of the art but also, more importantly, to identify emerging issues and thus future research directions.

Related to these objectives is the following subset of specific research questions that the paper will address:

- RQ1. How has the research landscape around local root and university in achieving SDGs evolved?
- RQ2. Who are the most influential authors and articles on local root and university in achieving SDGs?
- RQ3. How have the keywords and specific themes of local root and university in achieving SDGs evolved?

The rest of the paper is structured as follows. Section 2 outlines the methodological path and describes the methodological choice and the dataset construction procedure. Section 3 presents the main descriptive results of the systematic literature review and discusses the results of the bibliometric analysis by illustrating the emerging research clusters on the topic grassroots innovation toward sustainability. Finally, in the conclusion section we present limitations and directions for future research.

2. Data and Methodology

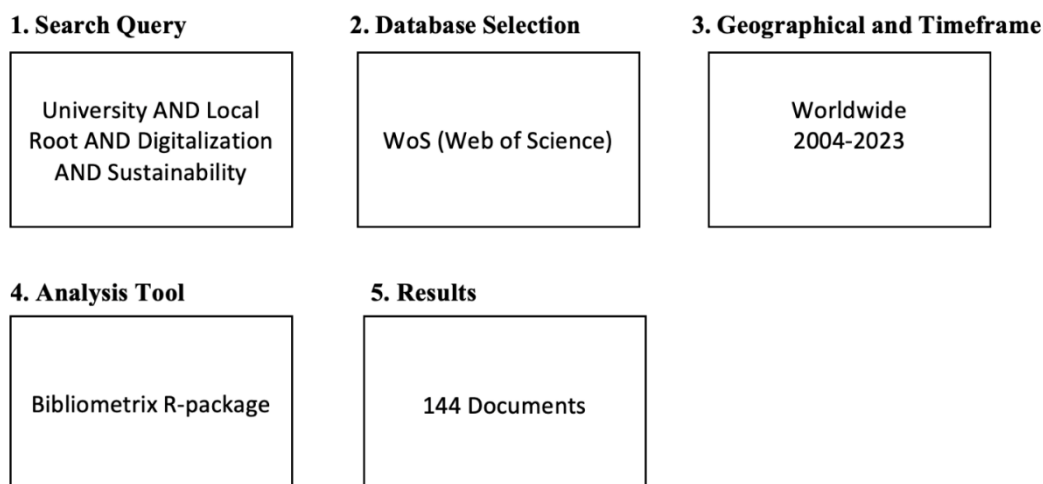
This work used bibliometric analysis tools to conduct the relevant literature on the topic. The bibliometric analysis allows a scientific study and a comprehensive view of the area of scientific investigation and thus contributes towards integrating these elements in the literature.

The application adopted in this research is based on Aria and Cuccurullo's software (2017): Bibliometrix. Bibliometrix was chosen as it enables the researchers to calculate descriptive statistics, bibliometric measures, and science mapping, using a large dataset and keeping a high level of rigour, transparency and replicability (Dada, 2018; Rey-Martí *et al.*, 2016; Wamba *et al.*, 2021).

The sample articles were collected using the ISI Web of Science (WoS) database. We selected the WoS database as it's widely recognized as a reliable academic database for bibliometric research as it contains a large number of high-profile and high-quality international academic publications (Batistič and der Laken, 2019; Zhang *et al.*, 2019) and it offers robust metadata suitable for bibliometric analyses (Gaviria-Marin *et al.*, 2019).

After several tests, the following search string was performed in the WoS search engine: "University" AND "Local Root" AND "digitalization" AND "Sustainability" (OR SdGs). We limited the search to articles written in English, selected only documents in the field of business, management, and sustainability, and excluded subject areas not pertinent to the scientific domain of our re-search. A total of 144 publications were retrieved from this search query, published since 2004. Figure 1 summarizes the researchers' research steps.

Fig. 1: The methodological framework of bibliometric analysis



Source: our elaboration

The final sample was examined through bibliometric analysis. The main results are:

- Annual production;
- Authors and citations analysis;
- Source analysis;
- Geographical distribution of the papers;
- Multiple Correspondence Analysis;
- Thematic Mapping.

MCA was used to help to recognise the thematic structure among a series of authors' keywords. Specifically, MCA allows obtaining a low-dimensional representation of the original data matrix by performing a homogeneity analysis of the documents by keywords. The words are plot-ted into a two-dimensional map where closer words are more similar in distribution across the documents. In addition, implementing a hierarchical clustering procedure on this reduced space leads to identifying clusters of documents characterised by common keywords (Tontodimamma *et al.*, 2021; Aria and Cuccurullo, 2017).

Thematic maps were performed to investigate the thematic evolution of the topic. This analysis helps provide knowledge to researchers and stakeholders regarding the potential of future research development of thematic areas within a field (Agbo *et al.*, 2021).

Thematic maps are two-dimensional diagrams plotting clusters derived from co-word analysis (Cobo *et al.*, 2011; Edvardsson *et al.*, 2022). Co-word analysis identifies groups or clusters of keywords that represent the different conceptual themes developed within a research field. Each cluster can be described according to its centrality and density. Centrality measures the strength of the links between a cluster and other clusters. Density measures the strength of the links between the keywords within a cluster (Callon *et al.*, 1991; Cobo *et al.*, 2011; Wamba *et al.*, 2021).

3. Results and discussion

Table 1 shows the main information about the data obtained. The 144 papers, covering a time span from 2004 to 2023, came from a variety of sources (journals, books, etc.) representing 71 entries. Preliminary examination shows that in this field of research the collaboration index is significantly high (3.05), in fact, only 27 papers have a single author. The sample has a good percentage of international co-authors (36.11%).

Tab. 1: Main information about data

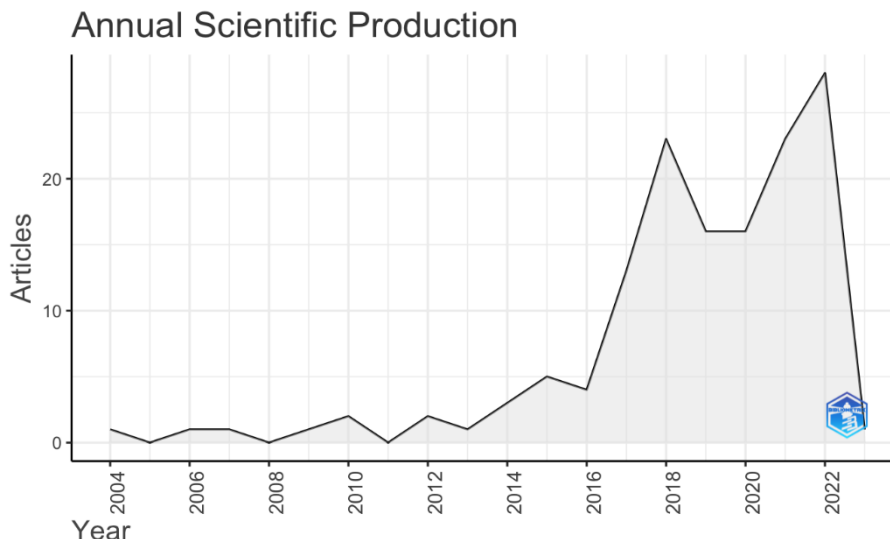
Timespan	2004: 2023
Sources (Journals, Books, etc.)	71
Documents	144
Single-authored docs	27
Documents per Author	0.34
Co-Authors per Doc	3.05
International co-authorships %	36.11

Source: our elaboration

Issues related to the Sustainable Development Goals (SDGs) and “local collective action” (indicating how civil society engages and act with sustainability transformations) have been gaining momentum in the literature, with exponential growth in the number of articles published in 2018 and a new peak in 2021-2022. Figure 2, which starts from 2004, illustrates when the first paper dedicated to this topic was written. In recent years, scholarly production has focused heavily on community-driven initiatives (CLIs) (Feola et al. 2023), Smart Local Energy Systems (SLES) (Devine-Wright et al. 2022) and Local Energy Initiatives (LEIs) (Hasanov and Zuidema 2022; Horlings et al. 2021; Soares de Silva and Horlings, 2020).

To meet the climate goals of the Paris Agreement, the European Commission has set a long-term goal of having a zero-carbon economy by 2050. Although the 2009 Renewable Energy Directive (RED) mandated that renewable energy sources must provide 20 percent of the Union’s total energy demand by 2020, a more challenging target was set in 2018. In fact, a more ambitious 2018 edition of the RED sets a new binding target of achieving 32 percent renewable energy by 2030. According to this new policy framework, the consumer is “at the center of the energy transition with a clear right to produce their own renewable energy”. The document states unequivocally that this directive enables individuals, groups, and organizations to become sustainable energy producers. This policy framework may justify the growing interest in this particular topic from 2018.

Fig. 2: Annual scientific production



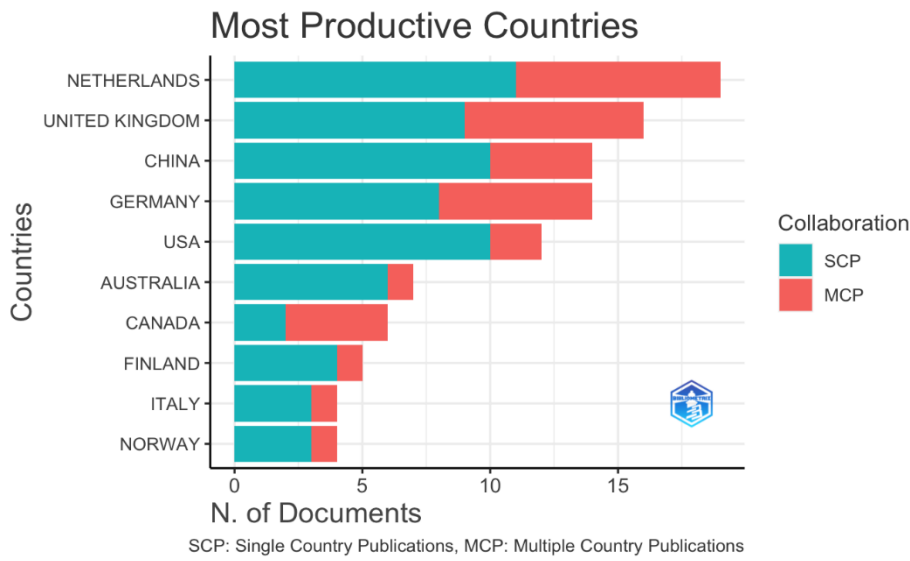
Source: our elaboration

In terms of the most productive countries (Figure 3) in first place is the Netherlands with more than eighteen articles of which more than ten are co-written by multiple authors. In second place is the United Kingdom with production exceeding fifteen articles. Equalized in third place are China and Germany with more than twelve articles.

The countries mentioned are also those with the closest author collaborations. In fact, as shown in Figure 4, there are collaborations between the United Kingdom, Germany, the Netherlands,

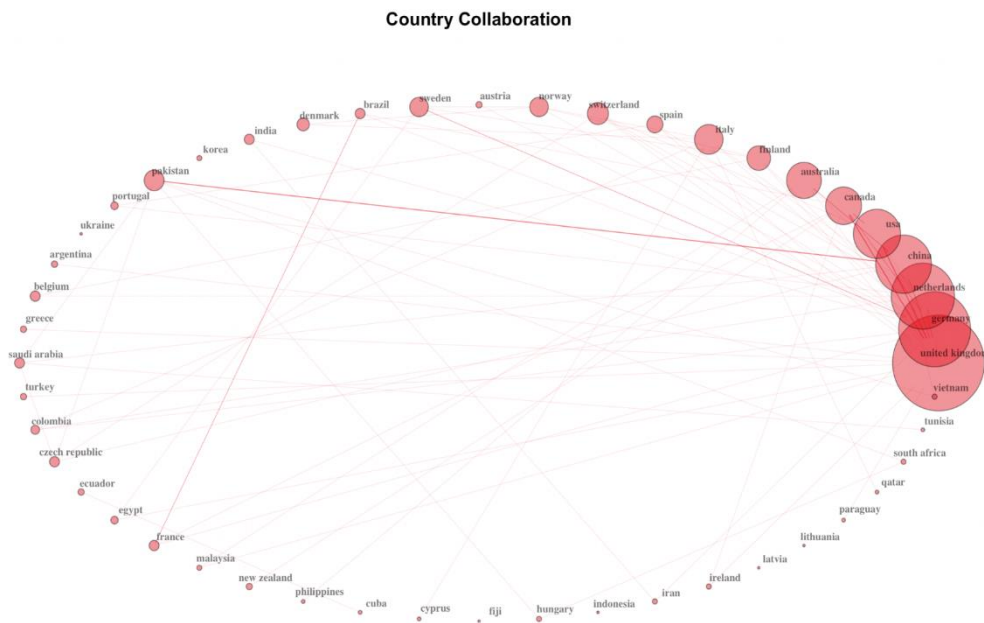
China and even Canada. The overall small, geographically fragmented and multi-handed scholarly production confirms the academy’s recent attention to the topic under consideration.

Fig. 3: Most productive countries



Source: our elaboration

Fig. 4: Country collaboration



Source: our elaboration

Table 2 describes the top ten sources from which we retrieved most of the documents analyzed. The most relevant is the journal Sustainability, published by MDPI, which with 30 published articles accounts for 37.5 percent of the entire sample. The second most relevant source is the Journal of Cleaner Production published by Elsevier, which provided 19 research articles i.e., 13.8 percent of the articles found. The fact that only a few journals, with topics on sustainability, have published on the topic under consideration confirms the fact highlighted earlier about the “novelty” of the topic.

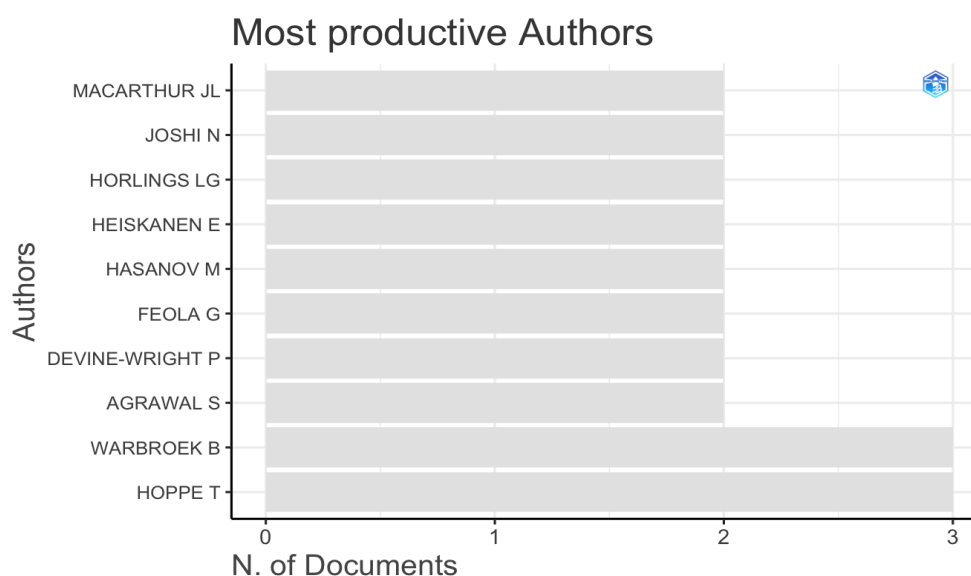
Tab. 2: Most Relevant Sources

	Sources	Articles
1	SUSTAINABILITY	30
2	JOURNAL OF CLEANER PRODUCTION	11
3	ENVIRONMENTAL INNOVATION AND SOCIETAL TRANSITIONS	9
4	LOCAL ENVIRONMENT	7
5	ENERGY POLICY	6
6	ENERGY RESEARCH & SOCIAL SCIENCE	5
7	TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE	4
8	RENEWABLE & SUSTAINABLE ENERGY REVIEWS	3
9	SUSTAINABILITY SCIENCE	3
10	BUSINESS STRATEGY AND THE ENVIRONMENT	2

Source: our elaboration

According to the number of papers published, Figure 5 displays the ten most productive authors. The results show that to date there is currently no real specialization among academics studying issues related to university-local root link in digital transformation toward sustainability, as the greatest number of articles written by an author is three. The most productive authors are Thomas Hoppe professor of Organisation and Governance at the Delft University of Technology and Beau Warbroek assistant professor at the University of Twente who have an output of 3 articles published. They are followed by the other most productive authors who each published two papers.

Fig. 5: Most productive authors



Source: our elaboration

The top two most productive authors, both with three articles to their credit, are Hoppe and Warbroek, who collaborated on all three articles and examined the study area between 2015 and 2018 (as shown by Figure 6). Their most recent article “The Role of Intermediaries in Supporting Local Low-Carbon Energy Initiatives” (2018) analyzes the roles and activities of intermediaries with respect to community energy development. The authors try to summarize the various roles and strategies that intermediaries can employ to support the development of local low-carbon energy initiatives (LLCEIs).

Hoppe and Warbroek ‘s second most recent paper (2017) is entitled “Modes of Governing and Policy of Local and Regional Governments Supporting Local Low-Carbon Energy Initiatives; Exploring the Cases of the Dutch Regions of Overijssel and Fryslân” and is based on a comparison of two case studies on Dutch regions to understand how local and regional governments innovate in

governing in response to the emergence of local low-carbon energy initiatives (LLCEIs). The results show that regional governments enable the development of LLCEIs by establishing and financially supporting intermediaries who, in turn, provide specific and expert support.

The most recent scientific output (2017-2023) of other most productive authors focuses on the study of sustainable technologies for social mobilization and community empowerment. This highlights how since 2018 community action has assumed an increasingly important role in debates about the transition to sustainability.

The latest paper by Devine-Wright et al. (2022), “Constructing practices of engagement with users and communities: Comparing emerging state-led smart local energy systems” based on interviews with partner organizations of 12 smart local energy systems (SLES) projects in the United Kingdom, analyzes the goals, methods, and motivations for public involvement. They identify some factors that appear to influence involvement in SLES projects (location, technologies and infrastructure, and project partners) emphasizing education and awareness raising as critical ways of engagement, especially for those citizens with little technical knowledge.

Also Feola and Nunes in a 2014 article titled “Success and failure of grassroots innovations for addressing climate change: The case of the Transition Movement” emphasized that for a sustainable transition initiative to be successful, grassroots projects such as education and community awareness must be developed, combined with the ability to run simple, non-bureaucratic, democratic and creative activities.

Another recent article by Feola et al. (2023), “Rethinking the sustainable development goals: Learning with and from community-led initiatives,” explores the actual and potential contributions of community-led initiatives (CLIs) to the Sustainable Development Goals (SDGs). The authors argue that CLIs have effectively realized key elements of the SDGs as intrinsic features of social and economic life in ways that tend to stimulate stronger forms of sustainability and broader notions of justice.

In “Local collective action for sustainability transformations: emerging narratives from local energy initiatives in The Netherlands” Hasanov and Zuidema (2022) examine how the intrinsic motivations and values of those engaged in local energy initiatives (LEIs) can help understand how local collective action is perceived and evaluated, identifying four distinct perceptions of local collective action (Localism, Facilitation, Orchestration and Radical Transformation).

In 2021 Horlings et al. with the article “Success, Failure, and Impact of Local Energy Initiatives in The Netherlands” explore the impact of local energy initiatives (LEIs) by determining their outcomes and using levels of involvement to rank success factors and barriers to success.

Joshi and Yenneti (2020) in their article “Community solar energy initiatives in India: A pathway for addressing energy poverty and sustainability?” analyze the community energy movement in India within the framework of “grassroots innovations for sustainability”. The aim is to provide a better understanding of the models, development, and characteristics of community-based energy initiatives for a more sustainable energy system.

Soares da Silva and Horlings (2020) in the paper titled “The role of local energy initiatives in co-producing sustainable places” investigate how government and citizen co-production through local energy initiatives can contribute to the creation of more sustainable places, indicating that local energy initiatives are place-based, conditioned by the characteristics of the physical space needed for renewable energy production, specific institutional arrangements, assets and capabilities of people characteristic of place, and past collaborations.

The article “From tip to toes: Mapping community energy models in Canada and New Zealand” by MacArthur and Hoicka (2018) examine community energy projects in Canada and New Zealand to define which community energy models emerged in, and how institutions and policy intervention shaped the differences in the two models.

In another article written as a single author, “Trade, Tarsands and Treaties: The Political Economy Context of Community Energy in Canada” MacArthur (2017) examines the emergence of community energy in the context of the energy sector’s broader movements toward increasingly powerful trade agreements, privatization and conflicts over indigenous rights in Canada. The author

argues that there is significant potential to strengthen the role of local actors in Canadian energy governance but points out that the adoption of community renewable energy varies widely across jurisdictions and depends on targeted policy interventions, human and financial resources, and political culture.

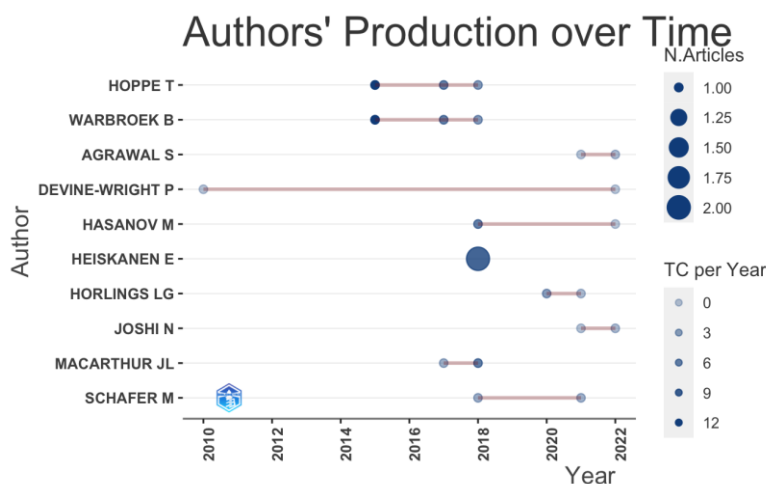
Within the more productive authors, many focus on the topic of community energy initiatives and the role of different actors in promoting and supporting sustainable, localized energy systems.

Some papers (e.g., Hoppe and Warbroek, Devine-Wright *et al.*, Hasanov and Zuidema and MacArthur and Hoicka) examine the role of intermediaries such as local authorities, energy cooperatives, and smart technology providers in supporting local energy initiatives. The first and the second authors emphasize the importance of intermediaries in facilitating communication, building relationships, and providing expertise, and the third authors argues for the importance of collaboration and partnership among different stakeholders in promoting sustainable energy systems. Although the different authors focus on different initiatives and contexts (local low-carbon energy initiatives in the Netherlands, state-led smart local energy systems in the United Kingdom, and local energy initiatives in the Netherlands, community energy models in Canada and New Zealand) all come to the same conclusion. They all highlight the need for more localized and sustainable energy systems, recognize that community engagement is critical to the success of these initiatives, and emphasize the role that intermediaries can play in facilitating the sustainable transition.

Other authors such as Hoppe and Warbroek (2017) or MacArthur (2017) have focused more on the role of local and regional governments in promoting local low-carbon energy initiatives, recognizing the importance of government support and policy frameworks in promoting the adoption of sustainable energy practices. However, the former takes a more policy-oriented approach, examining the different governance arrangements and policy instruments used by local and regional governments in the regions, and assesses their effectiveness by identifying key factors that contribute to successful implementation. In contrast, the second adopts a political economy perspective, examining the impact of trade agreements on local energy initiatives. The article identifies the challenges faced by local communities in promoting community energy projects due to the dominance of the fossil fuel industry and the influence of trade agreements. Overall, both articles provide valuable insights into the role of policy and governance in supporting local energy initiatives. Finally, the article by Feola *et al.* (2023), while dealing with the same issues previously mentioned, takes a global perspective on the contribution of community initiatives to sustainable development.

To take stock of the scientific output of the most productive authors: Feola and Nunes (2014) and Devine-Wright (2022) emphasize the importance of education in grassroots innovations for sustainability.

Fig. 6: Authors' production over time



Source: our elaboration

To perform the bibliometric analysis, the 10 articles with the most citations were analyzed (Table 3). The most cited article is “Grassroots innovation movements: challenges and contributions” by Smith et al. (2014) which has 228 citations. Their contribution compares recent experiences with technologies for social inclusion in Latin America with those for appropriate technologies in the 1970s to identify challenges facing grassroots innovation movements. Actors involved in these projects include local communities, public institutions, NGOs, cooperatives, citizens and universities. The latter provided research and development activities and technical knowledge by supporting their development.

In second place, with 157 citations Feola and Nunes (2014) with the paper “Success and failure of grassroots innovations for addressing climate change: The case of the Transition Movement” which analyzes the reproducibility of grassroots innovations in different contexts with the aim of discovering general patterns of success and failure. One of the conclusions they reach is that success depends on social connectivity, empowerment and external environmental impact.

Landrum and Ohsowski (2018) in their article titled “Identifying worldviews on corporate sustainability: A content analysis of corporate sustainability reports” try to understand the worldviews of corporate sustainability, or rather the corporate message conveyed about what sustainability or CSR is and how to implement it.

The paper “Local Governments Supporting Local Energy Initiatives: Lessons from the Best Practices of Saerbeck (Germany) and Lochem (The Netherlands)” by Hoppe et al. (2015) uses the literature on Strategic Niche Management (SNM) and grassroots innovation to analyze two best practice cases in Germany and the Netherlands. The authors identify which strategies have been effective in supporting Local Energy Initiatives (LEIs): network building, expectation management, and learning facilitation. They point out how an experiment in community partnership between a municipality, a university, a local public service and a community-based organization brought credibility and benefits to all parties.

North and Longhurst (2013) with the article “Grassroots Localisation? The Scalar Potential of and Limits of the ‘Transition’ Approach to Climate Change and Resource Constraint” argue that it is easier to organize small but visible and useful projects that communicate a clear vision. Therefore, urban centers could be fertile ground for making substantial progress toward the goals of the Transition movement.

With the paper “Statistical Evidence on the Role of Energy Cooperatives for the Energy Transition in European Countries” Wierling et al. (2018), analyzing four different European countries, confirm the importance of energy cooperatives in the transition to renewable energy systems. They state that an important factor that has contributed to the success of the creation of energy cooperatives are financial support programs.

In “Solar PV and solar water heaters in China: Different pathways to low carbon energy” Urban et al. (2016) examine the pathways to solar energy in China by looking at two different technologies: solar photovoltaic (PV) and solar water heaters (SWH). The authors seek to understand how different pathways to low-carbon innovation are promoted and challenged by China’s evolving financing and policies and how they relate to evolving practices between producers and consumers.

Gorissen et al. (2018) with their paper “Moving towards systemic change? Investigating acceleration dynamics of urban sustainability transitions in the Belgian City of Genk” examine the extent to which urban systems transition initiatives influence systemic change or accelerate sustainability transitions. They show that all five acceleration mechanisms (replicating, partnering, upscaling, instrumentalizing and embedding) are critical and that the local governance context is conducive to accelerating the dynamics of sustainability transitions, especially as it promotes diffusion, collaboration and embedding processes.

Fahmi and Sutton’s paper “Cairo’s Zabaleen garbage recyclers: Multinationals’ takeover and state relocation plans” (2006) analyzes plans for the privatization of solid waste management in Cairo. Their findings emphasize the importance of local participatory mechanisms for restructuring

solid waste collection and developing the recycling industry by putting vacant and underutilized areas to good use.

The article “Environmental rationalities and the development state in East Asia: Prospects for a sustainability transition” by Angel and Rock (2009) reviews what is known about recent trends in environmental governance in the newly industrializing countries of East Asia and the implications of these developments for a transition to sustainability. A major conclusion is that changes in socio-technical regimes in these countries may depend more on initiatives taken by mainstream industrial and urban development institutions and associated political elites. In addition, new strategic roles for the state also emerge from the article, such as the increasing emphasis on basic R&D and the development of a science and technology infrastructure within universities.

Almost all the most cited articles focus on the broader implications of the impact of human activities on the environment and the resulting environmental degradation, exploring this concept from different perspectives. Some authors such as Urban et al. and Fahmi and Sutton suggest strategies to reduce environmental degradation and conserve natural resources in ways that improve human health by illustrating how these changes can be implemented both technologically and economically. Other authors such as Gorissen et al. and Hoppe et al. provide a framework for incorporating environmental health into public health policies, by highlighting local governance interventions toward accelerating the transition dynamics toward sustainability through promotion, dissemination, collaboration, and financial support. Other articles by Smith et al. or Feola and Nunes (all written in 2014) delve into the idea of grassroots innovation and its potential to create viable solutions to environmental challenges, emphasizing that grassroots initiatives can offer innovative solutions that may not be accessible through traditional avenues. By involving local communities and empowering them to address global challenges, grassroots movements can create real and lasting change. Ultimately, both papers suggest that grassroots initiatives work best when viewed as a complement to larger government and corporate initiatives, rather than as a replacement.

Overall, all of the papers emphasize the significant role that human activity plays in the sustainability transition movement and the need for integrated and holistic approaches, across communities and institutions, to sustainability.

Tab. 3: Top manuscripts per citations

	Papers	TC
1	SMITH A, 2014, J CLEAN PROD	228
2	FEOLA G, 2014, GLOBAL ENVIRON CHANG	157
3	LANDRUM NE, 2018, BUS STRATEG ENVIRON	130
4	HOPPE T, 2015, SUSTAINABILITY-BASEL	111
5	NORTH P, 2013, URBAN STUD	65
6	WIERLING A, 2018, SUSTAINABILITY-BASEL	61
7	URBAN F, 2016, RENEW SUST ENERG REV	57
8	GORISSEN L, 2018, J CLEAN PROD	53
9	FAHMI WS, 2006, HABITAT INT	47
10	ANGEL D, 2009, TECHNOL FORECAST SOC	46

Source: our elaboration

We produced a semantic map of the research field using the MCA. Bibliometrix divided the network into three clusters, the details of which are shown in Figure 7.

The first Cluster (the red in Figure 7) is defined by the words “grass roots innovations”, “climate change”, “policy”, “transitions”, “community energy”, “renewable energy”, “transition”, “wind energy”, “power”, “participation”, which are some of the themes of these articles included in our literature evaluation. Climate change, renewable energy, and sustainability are interconnected issues

that have been extensively studied in recent decades. Many of the authors included in our literature review deal with the issues of grassroots innovations, community energy, and transitions that are integral to the sustainability movement and are considered critical to achieving the goals of reducing emissions and transitioning to sustainable energy sources. Other topics covered include participation and policy: essential components for achieving sustainability goals, as they ensure that all stakeholders are aware of the need for change and are actively involved in its implementation. Together these key words provide an overview of the many elements that must converge to create a sustainable future. This is in line with the records reported in Figure 8 and 9, that illustrate respectively the study that gave the highest contribution in the cluster, and the most cited one which in this case coincide with the paper by Hoppe et al. (2015) that discuss how local governments can support local energy initiatives for sustainable development. In the red cluster, among the most cited articles, we also find an article by Wierling et al. (2018) which confirm the importance of energy cooperatives in the transition to renewable energy systems, emphasizing how their success is aided by financial support programs. On the other hand, another paper that has contributed significantly is a work by Sarrica et al. (2018). The paper, written by Italian authors, is entitled “A multi-scale examination of public discourse on energy sustainability in Italy: Empirical evidence and policy implications” and analyzes the discourse on energy sustainability at the national, regional, and local levels. The article highlights the importance of renewable energy, energy efficiency, the need for better coordination in the transition to a low-carbon economy and the importance of strengthening public participation and engagement in energy governance.

The second cluster (the pale blue in Figure 7) contains the words “politics”, “governance”, “cities”, “initiatives”, “sustainability transitions”. These keywords emphasize that sustainability is a complex topic with several elements, each of which must be considered to understand how the concept of sustainability is implemented in the real world.

The topics covered by these keywords include policy, which plays a key role in sustainability, setting the rules and standards to be followed to ensure the long-term sustainability of the environment or intervening with forms of support for initiatives aimed at transition. The latter involves transforming a society so that it can move away from unsustainable practices and toward more sustainable ones. The theme also emphasizes the importance of governance understood as how society organizes itself to achieve sustainability goals. Cities, on the other hand, are important because they are where most people live and consume resources and following the concept of “local collective action” can have a positive impact on sustainability. Among the articles that have made the greatest contribution to the issues in this cluster are Grandin and Saarin (2020) with “What sticks? Ephemerality, permanence and local transition pathways” The authors explore the tradeoff between ephemerality, i.e., the temporary and transitory nature of many sustainability initiatives, and permanence, i.e., the need for sustained, long-term changes. Overall, the article provides valuable insights into the complexities of achieving sustainability and emphasizes the importance of a holistic and context-specific approach to transitions to sustainability. Also of significant impact is the article “Going back to the roots: the fourth generation of Swedish eco-villages” by Magnusson (2018), which, while addressing the topic of grassroots innovations, focuses on ecovillage initiatives by showing how they have taken different forms over time. Among the most cited studies in the cluster Gorissen et al. (2018) tying in with the theme “city” explores the dynamics of urban sustainability transitions by analyzing the various initiatives and policies implemented by the city of Genk, such as renewable energy production, energy efficiency and sustainable mobility. The second most-cited paper in the cluster is “Opening up the transition arena: An analysis of (dis)empowerment of civil society actors in transition management in cities” by Hölscher et al. (2019), which also focuses on the theme of cities and local initiatives. The authors point out that transition management also carries the risk of disempowerment, that is, of creating/exacerbating a sense of powerlessness and thus diminishing the ability of actors to take on roles in sustainability transitions.

The third cluster (the green in Figure 7) is represented by the words “management”, “sustainability”, “systems”, “energy”, “performance”. These key words are all closely related to the

concept of sustainability. Management involves the development and implementation of strategies to ensure sustainability is achieved. Systems must be in place to track and monitor energy use to ensure that performance is optimized, and sustainable practices are followed to reduce emissions or conserve resources. In the green cluster, the most contributing papers are “International Business as Disciplinary Tautology: An Ontological Perspective” and “Agile route-to market distribution strategies in emerging markets: The case of Paraguay” by Poulis (2018) and Boojihawon et al. (2021), two papers that diverge from the central themes analyzed so far. The first discusses the implications of disciplinary tautology for international business research and practice, emphasizing the need for a more critical and reflective approach to knowledge production and dissemination. The second focuses on understanding the factors underlying agile route-to-market RTM capabilities and how these influence the development of agile delivery strategies. The most cited papers in the cluster are written by North and Longhurst (2013) and Feola and Nunes (2014) two articles that discuss the effectiveness of the Transition Movement in addressing climate change and resource constraints, examining its successes and failures.

Fig. 7: Conceptual structure map

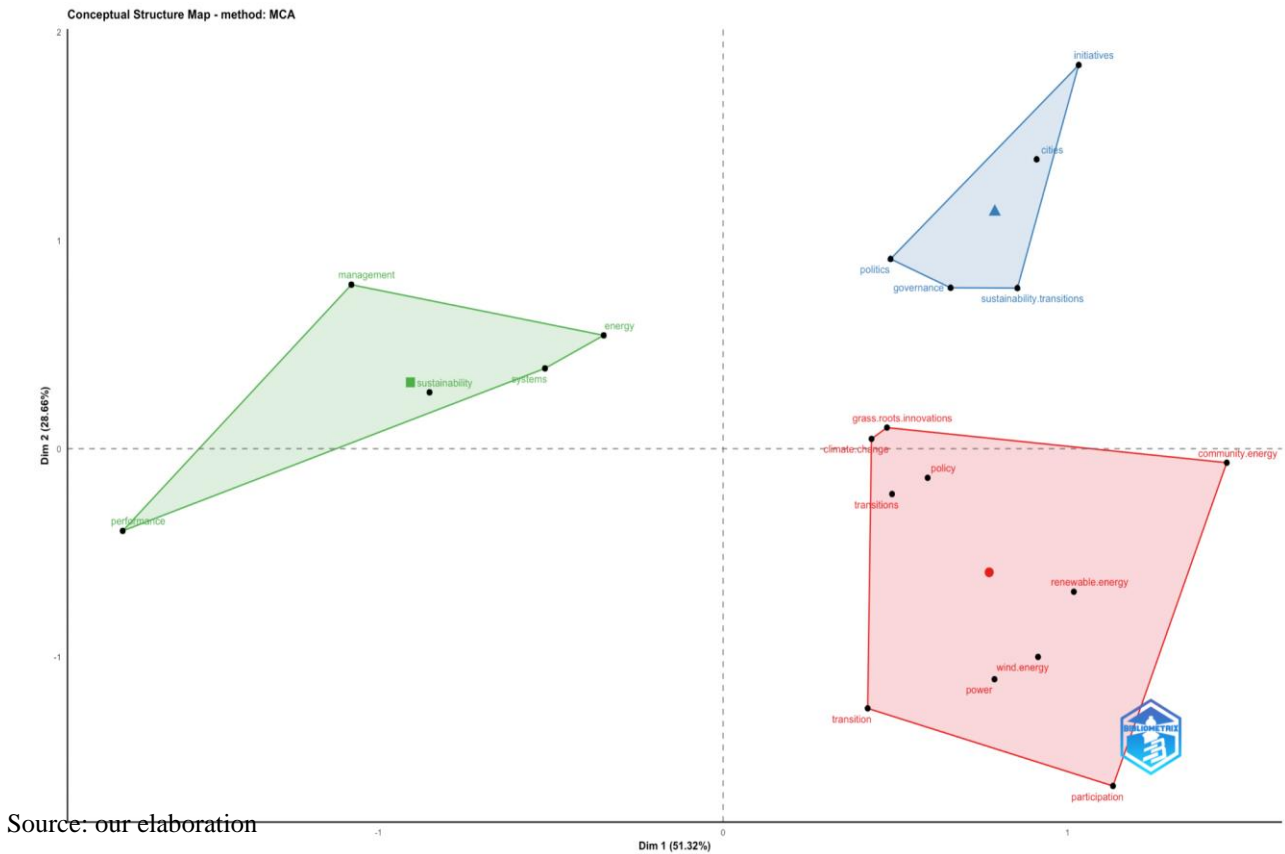
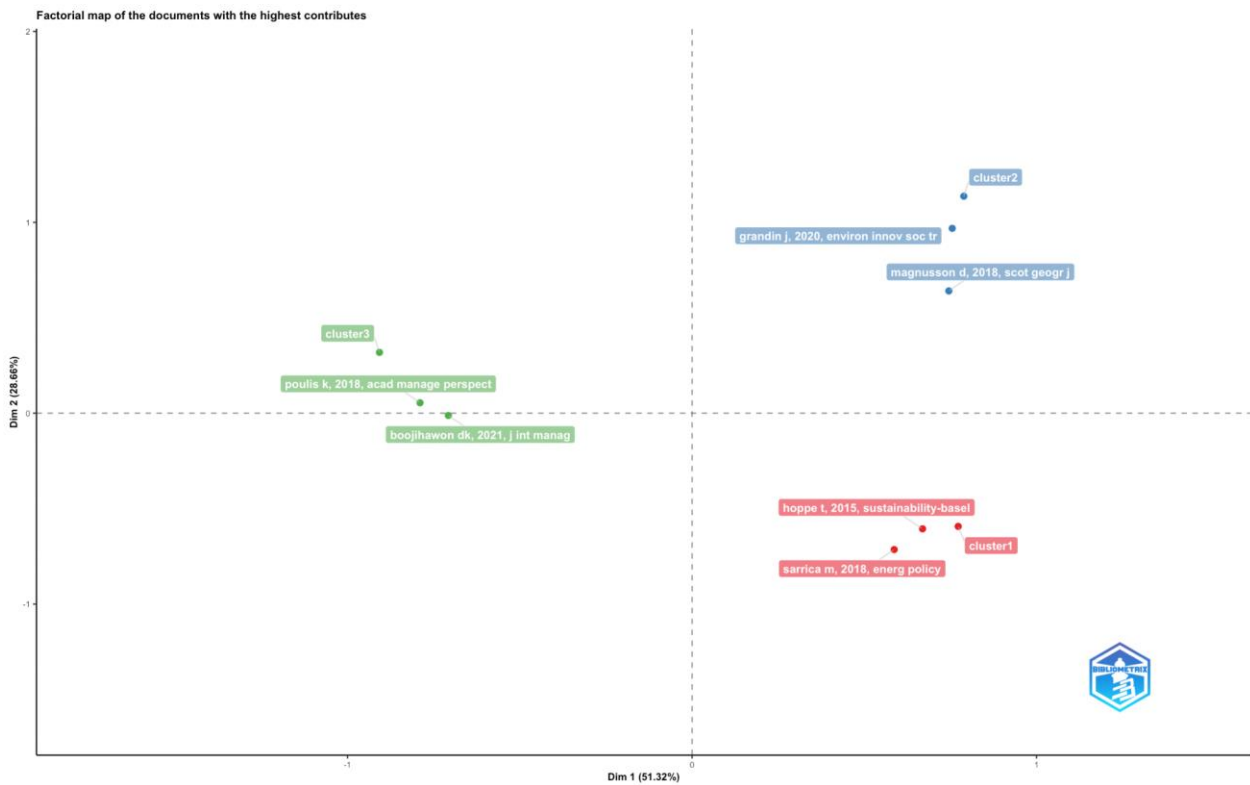
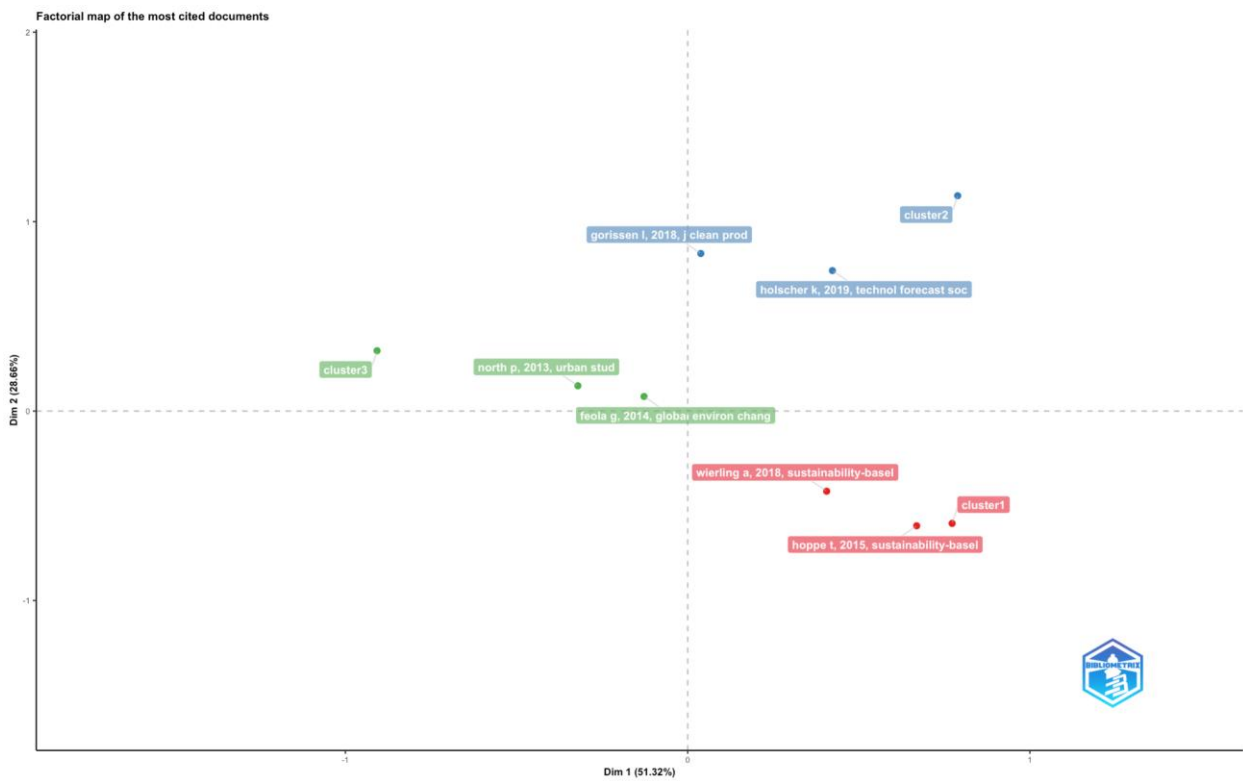


Fig. 8: Factorial map of the documents with the highest contributes



Source: our elaboration

Fig. 9: Factorial map of the most cited documents



Source: our elaboration

To identify the main topics, we analyzed the strategic diagrams, also called “thematic maps” (Cobo *et al.*, 2011), for the cleaned abstracts. In figure 10 each bubble corresponds to a

cluster/theme and helps us to draw a better picture of the topics covered in the literature, showing us a map of the Niche, Emerging or Declining, Motor, and Basic themes in the field.

The themes in the upper left quadrant are well-developed (high density) but peripheral (low centrality), meaning they have strong internal ties but unimportant external ties, so their importance to the research field is marginal. In particular, the words in this part of the matrix represents studies on impacts, indicators, and rural electrification, conservation, efficiency, resources, unit-root test or circular economy, government, panel data, quality, labor science, policies, trade off. Overall, all these keywords are interconnected and necessary to achieve the sustainability goals. They refer to the assessment and mitigation of the impact of human activities on the planet and its inhabitants and to the efforts of citizens and governments to promote the creation and implementation of sustainable development strategies.

The themes in the lower left quadrant are either weakly developed or marginal; they may represent emerging or declining themes, meaning that these themes are not established in the literature and may develop in different directions. This quadrant represents studies on time-series, identity and sharing economy, countries, economy, firms, and design. These issues cannot be in decline, as they are still very relevant and fundamental to the development of a sustainable economy, but they are issues that differ from the main contributions reviewed, which, for example, focus more on citizens rather than firms. In addition, the main trends in the literature that emerged in our analysis do not consider sustainable product design or sharing economy modes but focus on local energy initiatives.

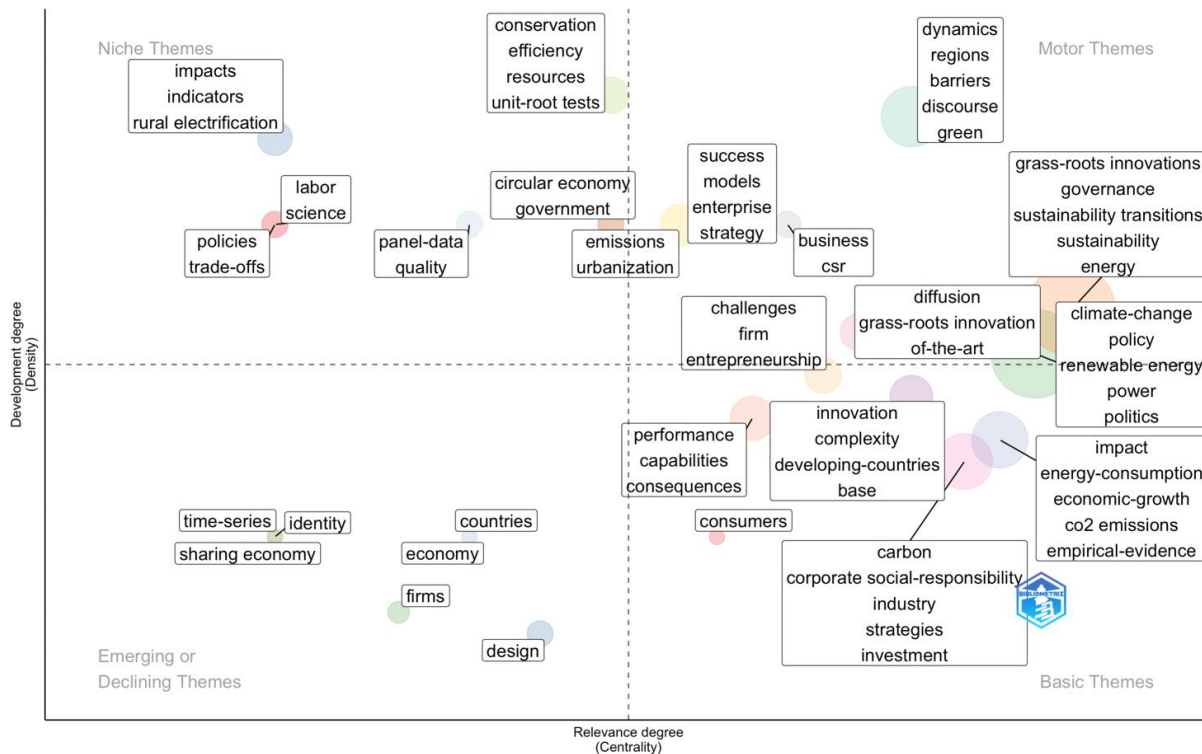
The themes in the lower right quadrant have very strong external links but unimportant internal links, which means they are very important to the research field, even if they are not well developed. The themes in this quadrant are general and cross-cutting. The pink-colored bubble represents studies on carbon, corporate social responsibility, industry, strategies, investment. These themes refer to the development of sustainable business strategies that incorporate social and environmental considerations, which can improve business performance and benefit society. Specifically in the context of business, reference is made to the need for industries to reduce their carbon footprint through sustainable practices, the need for sustainable investment practices in which investors consider the environmental and social impact of their investments, and, more generally, the corporate social responsibility (CSR) of operating in an ethical and sustainable manner. The pale blue bubble considers themes related to energy consumption, economic growth, CO₂ emissions. These issues are linked to achieving sustainability goals in the context of energy and economic development: through reducing energy consumption and increasing the use of renewable energy sources to reduce CO₂ emissions and mitigate climate change. The challenge is to balance economic growth with sustainable practices. Other themes we find in this part of the matrix are consumers, performance, capabilities, consequences, innovation, complexity, developing countries, base.

Finally, the themes in the upper right quadrant are the “driving themes”. These themes are both well developed (high density) and very important (high centrality). They have very strong external and internal links, which means they represent driving themes. Some of the themes contained in this quadrant relate to success, models, strategy, enterprises, business, CSR, challenges, firm, entrepreneurship, diffusion. The green bubbles contain the topics of dynamics, regions, barriers, discourse, green, that underscore the complexity and importance of achieving sustainability in different regions and the need for a collaborative and interdisciplinary approach. The pale orange bubbles contain the main topics covered by the most productive authors and recent articles: grassroots innovation, governance, sustainability transitions, sustainability, and energy. All of these themes emphasize the importance of innovation in energy transitions, governance, and innovative practices developed by communities or individuals with the support of government institutions as possible solutions to sustainability challenges.

The role of universities in fostering grassroots innovations toward sustainability is not evident from the thematic map, highlighting how, probably, there is still a current lack of studies that explore this issue in depth.

This is related to previous analyses of the most cited papers and most productive authors from which it emerged that only a few have made explicit in their research the role of universities and education in involving people toward local initiatives and providing a technical knowledge base.

Fig. 10: Thematic map



Source: our elaboration

4. Conclusion

The study highlights that the role of grassroots innovations in fostering the transition to sustainability is complex as it encompasses several aspects: studying how universities, local institutions and authorities can foster the emergence of community-based initiatives; determining modalities, goals, expectations and perceptions in involving the community in such initiatives; defining what role intermediaries can play in supporting local initiatives; analyzing development patterns and identifying the factors of success and failure of such initiatives; understand how these initiatives can help drive the 2030 Agenda and its Sustainable Development Goals.

First, we highlight the gap in the literature on studying the relationship between the university and grassroots innovations toward sustainability. Universities play a key role in achieving the SDGs, as they can help develop innovative solutions, train the next generation of sustainability leaders, and engage with local communities to promote sustainable development. Therefore, future research should focus on the university’s role as a partner in local initiatives to help the community and policy makers toward sustainable transaction, consistent with its role of third mission of science, technology, and cultural transfer. In addition, further research is certainly needed to better understand how the interaction between community initiatives, university, governments, and market actors influences and is influenced by a range of different values and intentions of these parties.

Finally, further research is needed on the various technologies through which local sustainable transaction initiatives are promoted by universities to capture potential dynamics in both public acceptance of a technology project and levels of attachment to place.

This work is not exempt from certain limitations, some of which could be the basis for future research. One of the limitations of our study is that we based our research on a unique database.

Researchers may conduct further analysis using other academic databases such as Scopus and Google Scholar. Research may further compare the outcomes of other databases to those proposed by our study.

Second, the query used to search the keywords on the databases could be a barrier to exploring other related themes. In addition, some exclusion criteria were imposed to improve the performance analysis (language and research fields). In the future, additional studies could adopt and extend our protocol for much better results.

Additionally, as this is a young research area, the analysis will be subject to recurrent obsolescence as multiple new research investigations are published. Further analysis could also identify why some parts of the world have yet to study this area. It would be helpful to conduct a comparative analysis between countries active in this research field and those not currently involved.

In practice, from a managerial, political, and social point of view, the study shows that the issue related to the relationship between the university and local root for achieving SDGs is complex and in constant evolution, and that there are no solving, universal, or easily applicable insights. As highlighted, the topic of grassroots innovations toward sustainability is still a current issue and a work-in-progress, which is likely to continue to have new developments in the coming years.

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Human Resource Development and Artificial Intelligence in the view of Personal Development: a literature review and bibliometric analysis

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Abstract

Framing of the research. *The advancement of AI is transforming the way human resources are managed in organizations, introducing new capabilities to Human Resource Management (HRM). Thus, there is a pressing need to examine new and more effective approaches to Human Resource Development (HRD).*

Purpose of the paper. *This paper aims to shed light on the current knowledge and contributions of the AI in HRD. In this way, we develop a holistic view of the role of AI in the employee journey.*

Methodology. *To achieve our goal, two types of bibliometric analysis was carried out: Keyword Co-occurrence Analysis and Bibliographic Coupling Analysis on a total of 151 publications published between 2002 and 2022. A similarity visualization program (VOSviewer) was used to visually showcase the results.*

Results. *Findings highlight the Top 5 Authors, Sources, Papers and Institutions, in terms of the prolificacy of contributions in the field of AI in HRD. The relevant contribution is the identification and classification of main topics and clusters that have been highlighted.*

Research limitations. *It should be acknowledged that the findings are rooted in one database, Scopus, and only publications in English were considered.*

Managerial implications. *We offer three theoretical and institutional implications for advancing further research on the AI in HRD literature. At the same time, findings from this research may also be of practical interest to companies.*

Originality of the paper. *This is one of the first bibliometric studies in the HRD and AI field in the view of Personal Development. Thus, we provide a first systematization of the contributions developed in the last twenty years in this novel field of research.*

Key words: *Artificial Intelligence; Human Resource Management; Human Resource Development; Personal Development; Literature Review; Bibliometric Analysis*

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1. Introduction

Human Resource Development (HRD) can be defined “*as a set of systematic and planned activities designed by an organization to provide its members with the opportunities to learn necessary skills to meet current and future job demands*” (Werner and DeSimone, 2011). The two major components of HRD are: i) training and development; ii) organization development (Swanson, 1995). Our research is related to training and development that is the “*process of systematically developing expertise in individuals for the purpose of improving performance*” (Swanson, 1995, p. 218). On this context, Artificial Intelligence (AI) - as computing technologies that simulate or imitate human-like intelligent behavior (Vrontis *et al.*, 2021) - can have an impact on humanity and the workplace. Although the discussion is often related to the percentage of traditional jobs that could be displaced by AI (Jackson and Kanik, 2019; Acemoglu and Restrepo, 2020; Ray and Mookherjee, 2022), it is important also to stress the benefits of AI in HRD, and generally in Human Resource Management (HRM).

Indeed, the advancement of AI is transforming the way how HR is managed in organizations, introducing new capabilities to HRM (Pillai and Sivathanu, 2018). For example, Strohmeier and Piazza (2015) have studied six key scenarios of AI in HRM, including turnover prediction using artificial neural networks, candidate search using knowledge-based search engines, staff rostering using genetic algorithms, HR sentiment analysis using text mining, resume data acquisition using information extraction, and employee self-service using interactive voice response (Strohmeier and Piazza, 2015). According to Makridakis (2017), the AI revolution seeks to replace, augment, and amplify tasks traditionally performed by humans, becoming a formidable rival to human labor. As a result, AI is poised to support all functions of HRM (Sivathanu and Pillai, 2018), playing a role in all stages of the Employee Life Cycle (Lee *et al.*, 2019; Zel and Kongar, 2020), and paving the way for “Smart Human Resources 4.0” (Sivathanu and Pillai, 2018).

Our focus in this research is related to Personal Development as a practice of HRD and can be understood as “*the employee opportunities to acquire and develop valuable resources in the form of skills, abilities and knowledge*” (Fletcher, 2019, p. 5).

In a rapidly changing economy, companies invest in electronic HR systems that support personal development of employees and thus they change their approach to learning (Lejeune *et al.*, 2021). However, one critical area is the implementation of appropriate learning strategies to employees. AI can help companies to solve these problems, enabling them, for example, to personalize employee career development and training programs (Zel and Congar, 2020), or to nurture their social and soft skills (Nambiar *et al.*, 2017; Aviv *et al.*, 2021).

This paper aims to develop a holistic view of the role of AI in the employee journey, *from cradle to grave*: from the university and the nurturing of student’s hard and soft skills to the assessment of the future skills needed to manage AI and extract more value from its use, all the way to the personal and professional development that takes place in firms.

Indeed, the existing research efforts on AI in personal development and HRD are sparse and fragmented. Moreover, the few literature reviews insisting on those themes lack generality: although these efforts provide useful insights into how AI can be used in HRD, they focus either on specific applications or domains. For the former case, Rahimi *et al.* (2021) focus only on virtual working environment applications; Jiang and Akdere (2021) investigate HR Analytics implications for HRD, and Henderikx and Stoffers (2022) focus on leadership and soft skills development. For the latter, Wollny and colleagues (2021) restrict their attention solely on the education sector, while Nosratabadi *et al.* (2022) analyze AI’s role only toward employees’ on-boarding, failing, moreover, to consider several relevant contributions. Finally, the contributions of Kambur and Yildirim (2022) and Sivathanu and Pillai (2018) offer only a glimpse of the capabilities of AI in personal and employee development, not reporting enough practical use cases and more practitioner-oriented implications. None of these studies ultimately make use of bibliometric techniques to help visualize the structure of contributions in the literature, and the linkages between authors, theoretical constructs, and thematic streams.

Therefore, this paper will contribute to the HRD literature in the following ways.

Firstly, there is a pressing need to examine new and more effective approaches to HRD (Whysall *et al.*, 2019). Accordingly, a bibliometric and literature review was conducted by analyzing 151 papers published since 2002 by 2022. Bibliometric analysis tends to be more objective and extensive in scope than other types of reviews (Fan *et al.*, 2022) and enables scholars to identify and provide an overview of the principal trends that have been published.

Secondly, this paper highlights the need for technological investment in Personal Development with reference to either educational and organizational spheres. In analyzing the literature under such lenses, we adopt a cross-contamination perspective that enriches both domains under the umbrella of AI for the Personal Development of the individual, whether student (who will eventually transition into workforce) or employee.

Thirdly, our research was not limited to the superficial and merely statistical analysis found in other studies insisting on similar areas such as (Mishra *et al.*, 2021), but significantly and extensively complemented the software-based bibliometric analysis with the authors' analogic reasoned analysis on the every cluster as a whole and in relation with other clusters, and within each cluster on the individual contribution and its linkages with the overarching themes and the other contributions even outside its assigned cluster.

The remaining paper is structured as follows. The following section explores the method and tools used for our research. Subsequently, the bibliometric analysis results are presented. Finally, we discuss and conclude the investigation by indicating the managerial implications, limitations and future avenues of research.

2. Methodology

2.1 Search Strategy

The primary data source for this study is Elsevier's Scopus database to identify pertinent and related research, using the following search query:

(TITLE-ABS-KEY (ai OR "artificial intelligence" OR "intelligent agent" OR "human-agent interaction*" OR "robot-human interaction*" OR "intelligent automation" OR "machine learning" OR "deep learning" OR "neural network*" OR chatbot* OR "AI coach*" OR "AI tutor*" OR "AI mentor*"))*

AND

TITLE-ABS-KEY ("human resource develop*" OR "human capital develop*" OR "human resource* improv*" OR "human capital improv*" OR "human capital train*" OR "human resource* train*" OR "human resource* coach*" OR "human capital* coach*" OR "hrd" OR "coaching" OR "personal develop*" OR "soft* skill*" OR "general skill*" OR "life* skill*"))*

AND

(PUBYEAR > 1999)

AND

LANGUAGE(ENGLISH)

AND

(LIMIT-TO (DOCTYPE,"cp")

OR LIMIT-TO (DOCTYPE,"ar")

OR LIMIT-TO (DOCTYPE,"cr")

OR LIMIT-TO (DOCTYPE,"ch"))

OR LIMIT-TO (DOCTYPE,"re")

OR LIMIT-TO (DOCTYPE,"bk")

The selection of search terms was informed by Vrontis *et al.*, (2021) and two sets of keywords were searched in various combinations, using the "advanced search" function.

The first set of keywords consisted of words that belong to or are related to AI, Machine Learning and chatbot domains.

The second set of keywords contained words that are relevant to Human Resource, HRM, coaching and Personal Development domains.

The purpose of having a wide range of keywords was to ensure the collection of literature was as wide and inclusive as possible. For this reason, we consider all the subject area of Scopus and academic works types (article, conference paper, review, book chapter and book).

2.2 Literature review relevance funnel

The search with the above query on the database involved the title, abstract, and keyword (authors keywords + index keywords) fields (Crossan and Apaydin, 2010; Pisani *et al.*, 2017) in order to skim the non-relevant works at the source, which for example cited AI as a buzzword, and at the same time avoid analyzing papers resulting from linguistic ambiguity.

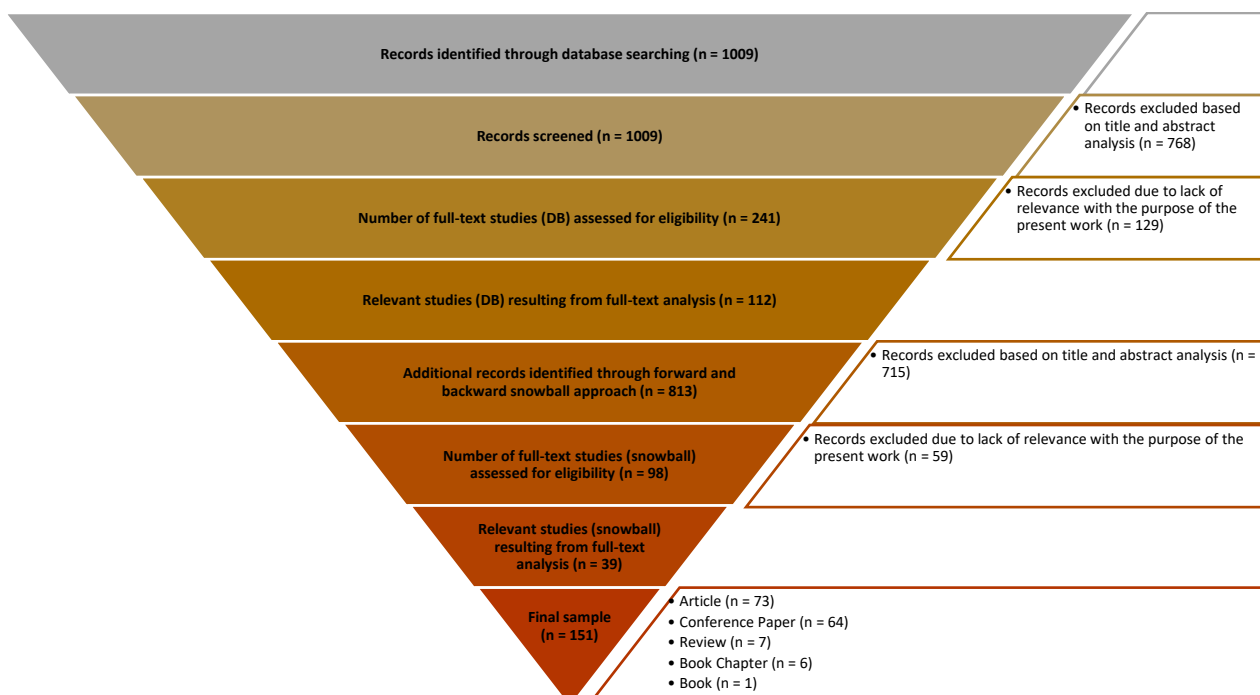
An additional screening effort was undertaken to address semantic ambiguity: for instance, in the fields of medical and environmental sciences, the acronym HRD represents vastly different concepts as compared to HR research, such as Homologous Recombination Deficiency, Hyper Reflective Dots, High-Risk Drinking, High-Resolution Density, and High Recommended Dose. As a result, these works were excluded from the present systematic literature review. This initial selection process was imperative in order to discard works deemed irrelevant and confine the full-text analysis to those that appeared pertinent for our literature review.

Based on the outcome of the first full-text analysis, it was deemed appropriate to expand the scope of exploration through the snowball methodology, utilizing Wohlin (2014) as a reference, and thus following both forward and backward snowball approaches. The corpus of scientific output resulting from the snowball approach was then subject to the same inclusion and exclusion criteria that were applied to the works resulting from the database search.

The first selection was based on the title and abstract, and only those deemed relevant were subjected to full-text analysis.

The flowchart for the dataset acquisition is shown in Fig. 1.

Fig. 1: Dataset acquisition flowchart.



Source: our own elaboration using a MS Word dynamic object.

2.3 Bibliometric analyses

The final sample of papers (151) was analyzed using a similarity visualization program (VOSviewer) to visually showcase some of the results. VOSviewer is a professional software designed to visualize intellectual structure (van Eck and Waltman, 2010) and the methods employed are used in the science mapping literature. The analysis and visual representation are of significant importance as they may aid academics and practitioners in comprehending the areas that have been studied in these topics more effectively.

The focal analyses performed using VOSviewer are Keyword Co-occurrence Analysis (KCA) and Bibliographic Coupling Analysis (BCA).

KCA is a preliminary thematic analysis and aims to construct a Keyword Co-occurrence Network (KCN), which has been demonstrated to be useful in exploring the relationship between research topics in various scientific fields. As noted by Radhakrishnan *et al.* (2017), multiple studies “*have demonstrated the practical value and advantages of KCN-based analysis over traditional literature review approaches*” (Radhakrishnan *et al.*, 2017, p. 2). KCA is suitable for preliminary research work which aims to guide future research efforts, by providing “*a knowledge map and insights prior to conducting a rigorous traditional systematic review*” (Radhakrishnan *et al.*, 2017, p. 1). This was accomplished by examining the relationship between keywords (both author and index keywords have been selected), using a full counting method. The threshold for the minimum number of occurrences of a single keyword was set to 2, and two keywords were considered to co-occur if they both appeared in the same title, abstract, or citation context. Furthermore, since the distance between two keywords in a KCN is approximately inversely proportional to their co-occurrence similarity, the clustering function in VOSviewer groups together keywords that frequently co-occur in the publications sample. This allows for a visual representation of the relationships between keywords and an understanding of how they are connected. In other terms, the clustering is based on the similarity (relatedness) of the keywords, with keywords that have a higher rate of co-occurrence being placed closer together (Waltman *et al.*, 2010; Bornmann *et al.*, 2018).

BCA, instead, is designed to analyze the intellectual structure of the subject. First introduced by Kessler (1963), bibliographic coupling seeks to identify links between publications that jointly cite another publication. Kessler proposed that bibliographic coupling can be utilized to indicate which papers should be read by whom (Weinberg, 1974) and has five main characteristics: i) bibliographic coupling is independent of language and words; ii) no expert judgment is required; iii) bibliographic coupling encompasses both the past and future; iv) the method does not produce a static classification for a given paper as the groupings are subject to change based on changes in literature usage; and v) papers that share a unit of coupling with a given paper can be considered its “logical references”. In contrast to other techniques such as co-citation analysis, bibliographic coupling is forward-looking, tends to prioritize younger research, and is useful in detecting the connections among research groups. It is also deemed more appropriate for studying emergent literature fields (Liu, 2017). The relatedness of documents in bibliographic coupling is established through the number of shared references. In this method, “N” documents are considered coupled when they possess “n” common references, where “n” is a minimum of 1. The connection between these documents is based on the overlap of their reference lists. The greater the number of shared references between two publications, the stronger the relationship between them.

3. Results

3.1 General statistics

The sample in this study consisted of a total of 151 publications by 160 authors affiliated with 160 institutions in 51 countries, which were published in 75 different sources and referred to 2156 cited references (cfr. Tab. 1). Database interrogation results were updated as of December 23, 2022.

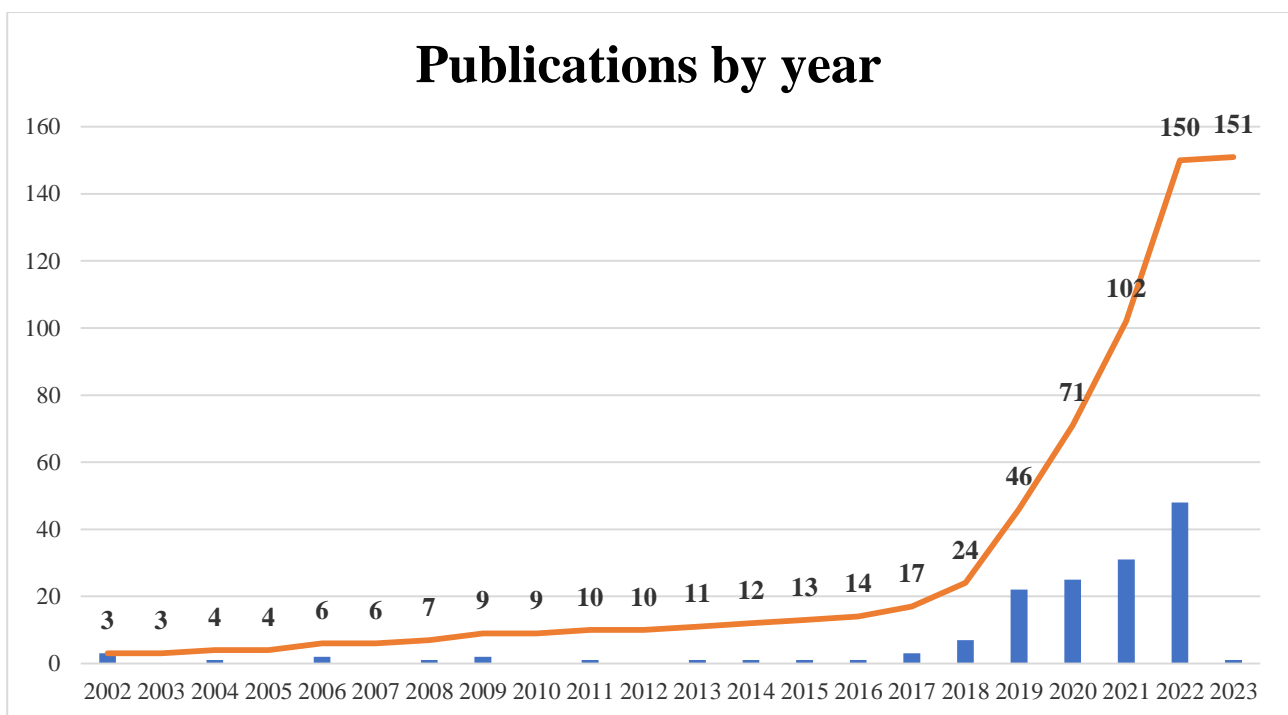
Tab. 1: Descriptive statistics of resulting publications.

<i>Publications</i>	151
<i>Authors</i>	160
<i>Sources</i>	75
<i>Institutions</i>	160
<i>Countries</i>	51
<i>Cited references</i>	2156

Source: our own elaboration on extraction process data.

Fig. 2 shows the distribution of publications in our sample by year, which indicates that the scientific field under observation is still in its infancy. Indeed, the graph shows that publications in three years have more than tripled, from 46 in 2019 to 150 in 2022.

Fig. 2: Publications distribution in the sample by year.



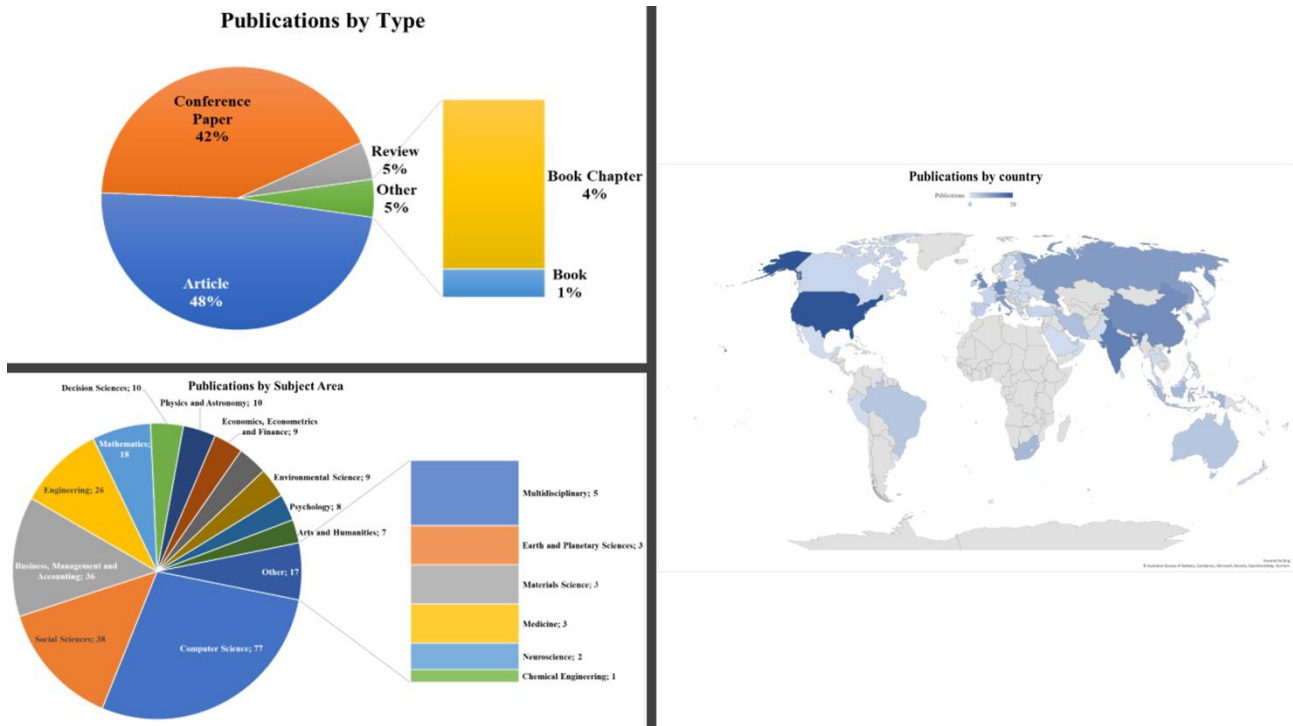
Source: our own elaboration on SCOPUS data.

Fig. 3 shows the distribution of publications by type, subject area, and country.

The extreme novelty of the field under investigation motivates the consistent presence of conference papers in the sample, since conferences offer swifter publishing mechanisms than journals and are more suitable to discuss novel topics and future scenarios among peer scholars. It's worthwhile to note also that the significant diversity of contributions in terms of subject areas (as indexed by SCOPUS) reflects the remarkably cross-cutting nature of AI as a General Purpose Technology (GPT) (Bekar *et al.*, 2017), encompassing even very diverse branches of knowledge.

Analyzing the distribution by country, we can observe the dominance of the United States of America, with 20 papers, followed by India, China, Germany, and the United Kingdom, which are the 4 most prolific countries after the US. However, it is important to note that the interest in the field is globally quite widespread, as our sample is populated by authors from 51 countries around the world (cfr. Tab. 1).

Fig. 3: Publications distribution by type, subject area and country.



Source: our own elaboration on SCOPUS data.

Tab. 2, 3, and 4 show respectively most prolific authors, sources, and institutions of the papers taken into consideration in the sample.

The significant presence in the conference paper sample is confirmed, as 3 of the top 5 sources are collections of proceedings. This is undoubtedly due to the aforementioned swifter publishing mechanisms peculiar to conferences, which favor the publication of papers in research streams that are not yet fully established, such as the one investigated.

In general, a fair distribution of scientific production is noted, considering that the Top 5 Authors, Sources, and Institutions, in terms of the prolificacy of contributions, represent in the most significant case (Top 5 Sources) less than 20% of the total sample. This result symbolizes a certain degree of plurality in the scientific landscape insisting on AI in Personal and Human Resource Development processes.

Tab. 2: most prolific authors (Top 5).

Most prolific Authors (Top 5)	Papers
<i>Terblanche, N.</i>	5
<i>Molyn, J.</i>	3
<i>Graßmann, C.</i>	2
<i>Härting, R.C.</i>	2
<i>Jayagopi, D.B.</i>	2

Source: our own elaboration on SCOPUS data.

Tab. 3: most prolific sources (Top 5).

Most prolific Sources (Top 5)	Papers
<i>Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics</i>	9
<i>International Journal Of Manpower</i>	5
<i>Journal Of Physics Conference Series</i>	5
<i>Sustainability Switzerland</i>	5
<i>ACM International Conference Proceeding Series</i>	4

Source: our own elaboration on SCOPUS data.

Tab. 4: most prolific institutions (Top 5).

Most prolific Inst. (Top 5)	Papers
<i>University of Stellenbosch Business School</i>	4
<i>Vrije Universiteit Amsterdam</i>	3
<i>Oxford Brookes University</i>	3
<i>University of Southern California</i>	3
<i>Texas State University</i>	3

Source: our own elaboration on SCOPUS data.

Tab. 5 shows most cited Sources sorted by number of global citations, and Tab. 6 the most relevant publications in the sample under investigation sorted by normalized citations. It's worthwhile to note that with the exception of that of Sivathanu and Pillai (2018), which is a review paper, the most influential contributions are all recent papers, which in spite of their young age and given the limited scope of the field have already accumulated a significant number of citations. This remark also holds true as further evidence of the vibrancy that has characterized research in this area in recent years.

Tab. 5: most cited sources (Top 5).

Most cited Sources (Top 5)	Citations
<i>IEEE Intelligent Systems</i>	870
<i>Sustainability (Switzerland)</i>	199
<i>Human Resource Management International Digest</i>	135
<i>Proceedings of the National Conference on Artificial Intelligence</i>	88
<i>Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)</i>	75

Source: our own elaboration on SCOPUS data.

The following tables, 7a through 7f, illustrate the keywords contained in each of the six thematic clusters. The number of occurrences of each keyword within the entire sample of papers is displayed, as well as their average “seniority”. The frequency of keyword occurrences provides insight into the dominant themes addressed in the reviewed literature, while the average seniority helps analyze the temporal trends present within each thematic strand.

Tab. 7a: KCN Cluster 1 (red) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>human resource development</i>	1	56	2018
<i>students</i>	1	12	2020
<i>computer vision</i>	1	8	2014
<i>e-learning</i>	1	8	2013
<i>virtual reality</i>	1	6	2015
<i>ai agent</i>	1	5	2007
<i>classification (of information)</i>	1	5	2020
<i>curricula</i>	1	5	2020
<i>surveys</i>	1	5	2020
<i>education computing</i>	1	4	2020
<i>multi agent systems</i>	1	4	2004
<i>project management</i>	1	4	2017
<i>teaching</i>	1	4	2015
<i>engineering education</i>	1	3	2020
<i>technological platform</i>	1	3	2008
<i>architecture</i>	1	2	2012
<i>distance learning environment</i>	1	2	2002
<i>extraction</i>	1	2	2022
<i>information use</i>	1	2	2019
<i>intelligent vehicle highway systems</i>	1	2	2009
<i>learning</i>	1	2	2021
<i>professional aspects</i>	1	2	2014
<i>professional competencies</i>	1	2	2020
<i>software prototyping</i>	1	2	2006
<i>technological resources</i>	1	2	2002
<i>virtual humans</i>	1	2	2011

Source: our own elaboration on VOSviewer export data.

Tab. 7b: KCN Cluster 2 (green) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>artificial intelligence</i>	2	66	2019
<i>chatbot</i>	2	22	2019
<i>coaching</i>	2	12	2021
<i>deep learning</i>	2	6	2021
<i>health care</i>	2	4	2019
<i>humans</i>	2	4	2022
<i>big data</i>	2	3	2020
<i>goal attainment</i>	2	3	2022
<i>human computer interaction</i>	2	3	2018
<i>article</i>	2	2	2022
<i>brain</i>	2	2	2020
<i>competences</i>	2	2	2021
<i>digital storage</i>	2	2	2022
<i>employee engagement</i>	2	2	2021
<i>human-machine interaction</i>	2	2	2022
<i>learn+</i>	2	2	2022
<i>mental health</i>	2	2	2019
<i>motivation</i>	2	2	2021
<i>reflection</i>	2	2	2021
<i>self-disclosure</i>	2	2	2021
<i>support tool</i>	2	2	2018
<i>systematic literature review</i>	2	2	2022
<i>working alliance</i>	2	2	2021

Source: our own elaboration on VOSviewer export data.

Tab. 7c: KCN Cluster 3 (blue) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>human resources</i>	3	28	2020
<i>human resource management</i>	3	26	2019
<i>neural networks</i>	3	12	2019
<i>decision makers</i>	3	6	2017
<i>decision support systems</i>	3	6	2020
<i>resource allocation</i>	3	6	2021
<i>managers</i>	3	5	2019
<i>algorithm</i>	3	4	2017
<i>hr analytics</i>	3	4	2021
<i>employee performance</i>	3	3	2021
<i>knowledge based systems</i>	3	3	2019
<i>semantics</i>	3	3	2015
<i>current</i>	3	2	2021
<i>development</i>	3	2	2009
<i>evaluation modeling</i>	3	2	2014
<i>image analysis</i>	3	2	2020
<i>long short-term memory</i>	3	2	2020
<i>ontology</i>	3	2	2012
<i>organisational</i>	3	2	2021
<i>simple multiattribute rating technique (smart)</i>	3	2	2019
<i>software design</i>	3	2	2021

Source: our own elaboration on VOSviewer export data.

Tab. 7d: KCN Cluster 4 (yellow) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>soft skills</i>	4	22	2019
<i>employment</i>	4	11	2021
<i>information management</i>	4	9	2020
<i>automation</i>	4	8	2021
<i>commerce</i>	4	4	2019
<i>robotics</i>	4	3	2020
<i>digital economy</i>	4	2	2021
<i>digital skills</i>	4	2	2019
<i>fintech</i>	4	2	2020
<i>innovation</i>	4	2	2019
<i>job analysis</i>	4	2	2021
<i>job satisfaction</i>	4	2	2021
<i>labor market</i>	4	2	2020
<i>r&d</i>	4	2	2020
<i>skill analysis</i>	4	2	2020
<i>support vector machines</i>	4	2	2021

Source: our own elaboration on VOSviewer export data.

Tab. 7e: KCN Cluster 5 (violet) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>industry 4.0</i>	5	11	2020
<i>education</i>	5	9	2020
<i>digitalization</i>	5	7	2021
<i>management</i>	5	5	2017
<i>digital transformation</i>	5	4	2021
<i>data mining</i>	5	3	2019
<i>leadership</i>	5	3	2021
<i>literature review</i>	5	3	2021
<i>case study</i>	5	2	2021
<i>higher education</i>	5	2	2020
<i>resource management</i>	5	2	2020
<i>sensitive application</i>	5	2	2021
<i>south korea</i>	5	2	2021
<i>strategic approach</i>	5	2	2021
<i>sustainability</i>	5	2	2021

Source: our own elaboration on VOSviewer export data.

Tab. 7f: KCN Cluster 6 (light blue) keywords list.

Keyword	Cluster	Occurrences	Avg. Year
<i>machine learning</i>	6	33	2020
<i>natural language processing</i>	6	17	2021
<i>fuzzy neural networks</i>	6	5	2016
<i>recruitment</i>	6	5	2021
<i>efficiency</i>	6	4	2021
<i>competencies</i>	6	2	2016
<i>knowledge management</i>	6	2	2016
<i>knowledge workers</i>	6	2	2021
<i>lifelong learning</i>	6	2	2021
<i>process automation</i>	6	2	2022
<i>productivity</i>	6	2	2022
<i>social networking (online)</i>	6	2	2021

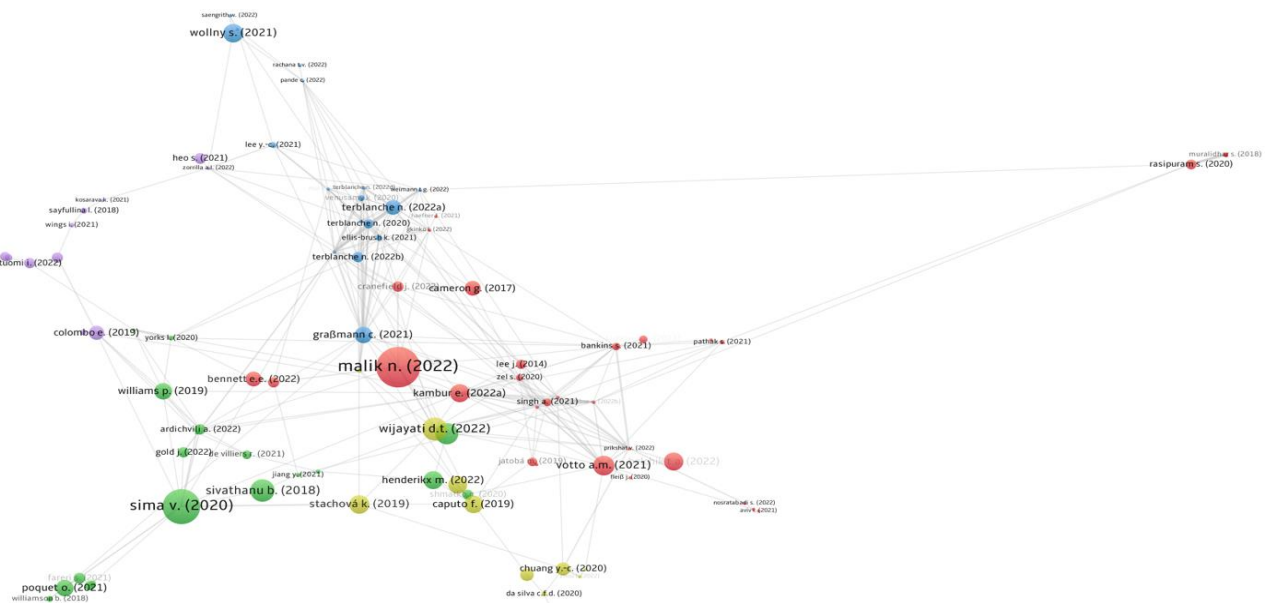
Source: our own elaboration on VOSviewer export data.

3.3 Bibliographic Coupling Analysis

The Bibliographic Coupling Network (BCN) generated by VOSviewer, with the minimum numerosity of each grouping set to 10, consists of 92 (out of 151) papers interconnected by 274 links with a total link strength of 466. The visualization of the network, as shown in Fig. 5, highlights the presence of five distinct bibliographic clusters, which exhibit some degree of imbalance in terms of their size, with at the ends of the spectrum Cluster 1 collecting 31 papers and Cluster 5 hosting only 11. The network nodes have been weighted by normalized citations: in this way the larger ones represent the most relevant contributions also in relation with their “seniority”. From a brief visual overview of the network, it is apparent that clusters are mostly well segmented from each other, apart from Cluster 2 and Cluster 4 that present a discrete overlapping in terms of

intercluster proximity, meaning that those neighboring contributions share a fair amount of references with each other, even though they belong to different clusters. Cluster 3, on the other hand, appears incredibly verticalized thematically, and of all the clusters in the BCN presents the highest degree of internal consistency: such an excellent result could be related to the compactness of the reference literature that specifically insists on AI coaching and its recency (in terms of mean publication year), as compared to the other clusters and the full sample of papers. It's worthwhile to note also that intracluster distance is in most cases not exaggerated, hence we can expect a fair amount of coherence between neighboring papers insisting on the same cluster. They are apparent, however, some peripheral sub-clusters which exhibit a large intracluster distance, strikingly represented by (Nambiar *et al.*, 2017; Muralidhar *et al.*, 2018; Rasipuram and Jayagopi, 2020; Nayak *et al.*, 2022) and to a lesser extent by (Wollny *et al.*, 2021; Kuhail *et al.*, 2022; Saengrith *et al.*, 2022) and (Williamson *et al.*, 2018; Fareri *et al.*, 2021; Poquet and de Laat, 2021). From these contributions we can expect less intracluster and furthermore intercluster coherence, since are linked with other contributions by few references. It also cannot be neglected that 59 contributions out of the total 151 populating the sample under review have not been clustered by VOSviewer: this is because they apparently share no reference either with those 92 included in Fig. 5 network nor with each other. This testifies the extreme interdisciplinary nature of scientific research effort on AI, even in a niche such as the one investigated. Likewise, this attests to the extreme vibrancy of the field, given that many of the contributions in the sample rest on unshared and not yet consolidated literature.

Fig. 5: Bibliographic Coupling Network.



Source: VOSviewer.

4. Discussion

4.1 Keyword Co-occurrence Analysis

Cluster #1-red (*AI in students' skills development*) largely shows topics concerning students and AI systems to support the development of students' skills, including professional skills. The papers that insist on these themes are mostly institutional-oriented in nature. For example Odrekhevskyy *et al.* (2019) propose a novel approach to the building of Intellectual Virtual Learning Environments (IVLE) in the university education system, toward the transformation of the *student learning journey* from a "teacher-student system into a teacher-IVLE-student system" (Odrekhevskyy *et al.*, 2019, p. 4). In those systems AI acts as an expert system that supports the learning process and

evaluates its outcomes, with the teacher that assumes a more creative role, making final decisions, and managing the double-ended interaction process. Another interesting example is that of Johnson *et al.* (2019), who propose an intelligent tutoring system fueled by an AI agent that trains and evaluates students' negotiation skills and tactics. The authors show that students interacting with those intelligent agents “*improve in their use of both value-claiming tactics through a combination of practice and personalized feedback*” (Johnson *et al.*, 2019, p. 125).

Cluster #2-green (*AI Coaching with chatbots*) addresses the multifaceted theme of coaching with intelligent systems and agents like AI chatbots, with reference to studies that devote such tools to both students (Mai *et al.*, 2021; Terblanche *et al.*, 2022c), and workers and managers (Graßmann and Schermuly, 2021; Schermuly *et al.*, 2021). The former perspective is represented for example by Mai *et al.* (2021), that by testing the interaction between a chatbot and university students on exam anxiety offer useful insights on how the disclosure by chatbot of information about the topic leads to the increase of interaction, self-disclosure and rapport by the user. The authors conclude also that, in line with other contributions (Justice *et al.*, 2020; Vysotskaya *et al.*, 2020; Yorks *et al.*, 2020), the interaction with a chatbot acting stimulates users' personal reflection, which is seen as a goal in coaching (Kanatouri, 2020). The latter orientation can be usefully synthesized by Graßmann and Schermuly (2021), who offer innovative insights on the use of AI in HRD processes and how it can be used in coaching as a key tool. The authors in fact provide a conceptual systematization of AI coaching, defining it as “*a machine-assisted, systematic process to help clients set professional goals and construct solutions to efficiently achieve them*” (Graßmann and Schermuly, 2021, p. 109). The authors argue that AI coaching systems can learn from large databases of human-to-human coaching processes and become more efficient in helping clients achieve their goals, and they have the advantage of adaptability to the user they interact with. However, the study also points out that it is unlikely that AI will completely replace human coaches and that human coaches are essential in the beginning of the coaching process as AI cannot understand clients' underlying needs and goals.

Cluster #3-blue (*AI and HR analytics*) refers to a small number of contributions proposing the implementation of AI-fueled decision support systems to improve HR allocation, evaluate employee performance and augment HR analytics. An illustration of the application of AI in HR analytics can be seen in the study conducted by Salvetti *et al.* (2022). The authors collaborated with an Italian insurance company to develop a training project that leverages HR analytics and AI. The HR analytics helped to gather valuable information, such as the organizational climate, performance metrics, and key competencies and skills of each employee. This information was used to design a learning and development plan, which was implemented using an online learning platform featuring mixed-reality simulations enabled by virtual reality (VR) and AI technologies. Another example in this vein is that of Solichin and Hana Saputri (2021), who proposed a method to improve HR allocation through the use of Artificial Neural Networks: based on several HR metrics, their system was able to provide recommendations to the managers of an Indonesian manufacturing company regarding the transfer of employees to other branches, thereby enhancing the efficiency and effectiveness of HR decision-making processes. Another study that insists on this issue is from Sihombing and colleagues (2019), who implemented a decision support system to assist HRD managers in the selection of the best employee in a more effective and efficient way, overcoming the limitations of human biases and bounded rationality.

Cluster #4-yellow (*AI and future skills development*) represents the broad themes of soft skills, future skills and employment scenarios in a deeply and more than ever digitized workplace environment and society in general. For example De Villiers (2021) proposed a model that can be used by business schools to ensure that graduates can fully contribute to a society impacted by automation and AI by entering the workplace with the requisite skills: the author identifies seven guiding principles to aid educators in the preparation of accounting students for the changes (and challenges) brought by automation and AI. Another example is that of Rodriguez-Ruiz *et al.* (2021), who implemented Natural Language Processing (NLP) tools based on AI to develop and especially assess students' digital literacy skills. The authors show that the use of the proposed NLP tools in the skills assessment phase helps to “*avoid interpretation biases on the part of the teacher and*

provoke a perception of trust on the part of the students” (Rodriguez-Ruiz *et al.*, 2021, p. 7), enhancing the perception of the validity and reliability of those assessment instruments. A further example on these issues is that of Johnson *et al.* (2020), who propose a novel approach, based on Machine Learning (ML) and other digital technologies, to the teaching of software engineering to Computer Science undergraduate students. The authors demonstrate that using this approach enhances students’ career readiness, by “improving preparedness in students for computing job interviews” (Johnson *et al.*, 2020, p. 10).

Cluster #5-violet (*Industry 4.0 and contextual factors*) appears to be at the nexus between Cluster 1 and Cluster 4: this should not be surprising, since all literature reviews in the sample (Sivathanu and Pillai 2018; Sima *et al.* 2020; Härting *et al.* 2021; Rahimi *et al.* 2021; Wollny *et al.* 2021; Gkinko and Elbanna 2022; Kuhail *et al.* 2022; Nosratabadi *et al.* 2022) can be traced back to this cluster. This cluster encompasses a mixture of broad themes treated in other clusters, with no contribution, apart from reviews, pertaining exclusively to it.

Cluster #6-light blue (*Fuzzy logics in HR recruitment and training*) refers to a discrete number of contributions in our sample that address the selection and training of human resources with the support of AI systems based on fuzzy logics. For example da Silva *et al.* (2020) leverage Fuzzy Sets Theory to analyze HR data of two companies in the electric sector in Brazil: their model was able to understand the main aspects that must be improved to develop human capital in a more reliable way, by reducing the subjectivity due to human evaluation. Since human capital stands as “one of the main factors of competitive advantage” (da Silva *et al.* 2020, p. 5) of companies, this study fuels the belief that the implementation of AI systems in those HR processes effectively yields a competitive advantage. Another technical contribution to this topic is that of Maddumage *et al.* (2019), who proposed an intelligent recruitment system based on NLP techniques supported by a fuzzy inference system. In particular, their system demonstrated effectiveness in resolving ambiguous scenarios where human evaluators face difficulty in making decisions, such as when two candidates receive the same score. The implementation of fuzzy logics in such situations helps to clarify and make a final decision. Similar results are those presented by Fachrizal *et al.* (2019), whose e-recruitment system is made to speed up the recruitment process and support HR decisions, and by Michalopoulos *et al.* (2022), with the quantification and prediction of employees’ skills and productivity that provides granular metrics for each employee enabling a more effective employee ranking process. An additional contribution is that made by Zhou and colleagues (2022), as their method is not limited to the evaluation of candidates’ performance, but also provides constructive criticism or suggestions for employees in professional and personal improvement, pushing the AI intervention toward an actual HRD.

4.2 Bibliographic Coupling Analysis

Cluster #1-red (*AI in HR and contextual factors*) is the most crowded of the five and appears as a large scientific cauldron populated with loosely coupled papers. Although they all deal with the themes of AI in HR in the context of Fourth Industrial Revolution (4IR), there are contributions (Jatobá *et al.*, 2019; Mishra *et al.*, 2021; Pathak and Solanki, 2021; Singh and Shaurya, 2021; Votto *et al.*, 2021; Kambur and Yildirim, 2022; Nosratabadi, *et al.* 2022; Xin *et al.*, 2022) that address those themes with a broad perspective on all HR processes encompassing all phases of the employee lifecycle. For the purposes of the present paper, it is useful to highlight, for instance, the result by Votto and colleagues (2021), who state that AI has the potential to make HR processes more efficient in organizations by providing customized training recommendations based on employee strengths, interests, and potential for success. Digital training assistant, like AI-based chatbots, can store experienced employees’ best practices and monitor performance; they do not possess, however, the in-depth knowledge that experienced workers have and are therefore unable to completely replace HR trainers. In addition, by utilizing AI-based virtual reality simulations for mandatory employee training, companies can improve participation, boost efficiency, and lower costs of training initiatives. These AI-enhanced training tools should be used to supplement

employee development, with human input providing a personalized touch to the employee's onboarding process. Organizations can therefore create smarter learning platforms to improve performance and cultivate talented, innovative and diverse employees; in this scenario, AI tools must be designed and geared to interact with employees and foster their growth within the company.

Other contributions (Nambiar *et al.*, 2017; Muralidhar *et al.*, 2018; Rasipuram and Jayagopi, 2020; Aviv *et al.*, 2021) focus on AI-based soft skills assessment and training in the workplace. These works mainly highlight the benefits for job candidates and employees deriving from the interaction AI-based virtual agents, which enable them to receive automatic and personalized feedback to improve their social and soft skills. Several other studies (Rahimi *et al.*, 2021; Bennett and McWhorter, 2022) further elaborate on the implications of AI in virtual training of employees, by studying the transformation of virtual workplace environments and digital employee experience related to AI. For example, digital automation frees up HR teams' time, allowing them to focus on building stronger relationships with employees, managers, and job candidates to better meet their needs (Zel and Kongar, 2020).

Cluster #2-green (*AI in education and future skills*) insists on the influence of new technologies on personal development in an educational perspective, and the implications in terms of skills needed for the workplace of the future. In this vein, Sima *et al.* (2020) state that the 4IR exerts a significant influence on human capital development, changing the way work and employment are conducted and the required skills of employees. The rise of automation and robotization is leading to job loss in repetitive, routine sectors, mainly affecting lower-educated workers. As a result, workers need to acquire new skills to cope with the transformations in production processes and attain greater job satisfaction and security (Bhargava *et al.*, 2021). Digitalization is affecting the entire economic and social environment, requiring a new set of skills for emerging types of work and impacting higher education. Labor markets are experiencing a lack of ICT professionals, with a shortage in the advanced manufacturing sector where big data and cybersecurity skills are needed. To cope with these changes, the authors recommend a combined effort from government, schools and universities, trainers, and companies, in order to adapt curricula and increase IT skills and innovation skills of the workforce. 4IR requires education systems that focus on knowledge beyond what is currently taught and stimulates creativity from an early age (Sivathanu and Pillai, 2018). The educational point of view toward 4IR is also pursued by Williams (2019), who stresses for instance the importance for universities to leverage AI-enabled learning analytics, to preemptively identify students at risk of failure and tailor tutoring initiatives for them. Poquet and de Laat (2021) then address the topic of learning analytics from the broader perspective of lifelong learning, stressing the opportunity to shift the purpose of learning from human capital to human development, with the focus on capabilities, envisioning "*AI-based technologies as a partner in cognition*" (Poquet and de Laat 2021, p. 1703).

Cluster #3-blue (*AI Coaching with chatbots*) appears incredibly verticalized, thematically speaking, on coaching implemented with AI-based chatbots and presents the highest degree of internal consistency. The contributions in this cluster also appear to be the most coherent and functional for the purposes of this paper. This cluster, indeed, exhibits a dual soul, which in a holistic review paper on AI, encompassing the entire employee journey *from cradle to grave*, is worth emphasizing: although the majority of contributions envision AI coaching in workplace scenarios, some influential papers, like for example that of Wollny *et al.* (2021), decline it in the educational context, shaping it in the form of AI tutoring and mentoring. According to Wollny *et al.* (2021), indeed, the primary objectives for the implementation of AI-based chatbots in the education sector can be summarized into four categories: i) Skill Improvement; ii) Efficiency of Education; iii) Enhancement of Student Motivation; and iv) Availability of Education. They identify also three different pedagogical roles assignable to AI chatbot in education: Learning, Assisting and Mentoring. Chatbots can in fact support learning in various ways, such as through integration into the curriculum as a learning aid or through additional offerings outside of the classroom. One example of this is a chatbot simulating a virtual pen pal that helps students practice language skills.

Chatbots can also assist students by simplifying their daily tasks, such as providing information or automating processes. Additionally, chatbots can serve as mentors to students, focusing on their Personal Development and encouraging reflection and assessment of their progress. Other contributions in Cluster 3 related to the educational domain (Mai *et al.*, 2021; Kuhail *et al.*, 2022; Terblanche *et al.*, 2022c) are quite consistent in results with (Wollny *et al.* 2021), producing pretty similar categorizations and taxonomies for AI tutors and mentors in terms of objectives and roles. Kuhail and colleagues (2022) however, highlight several limitations of these systems that are worth noting: inadequate dataset training, lack of user-centered design, losing interest over time, lack of feedback, and distractions.

Shifting the focus from the educational to the workplace and professional context, the research by Graßmann and Schermuly (2021) is by far the most prominent, representative and influential paper in Cluster 3. The authors present a pioneering examination of the utilization of AI in HRD and its potential as a crucial tool for coaching. They formulate a systematic framework for AI coaching, characterizing it as a “*a machine-assisted, systematic process to help clients set professional goals and construct solutions to efficiently achieve them*” (Graßmann and Schermuly, 2021, p. 109). The authors contend that AI coaching systems have the capability to acquire knowledge from extensive databases of human-to-human coaching sessions and, as a result, become more proficient in helping clients attain their objectives. The authors assert that AI coaching has the potential to effectively assist users in navigating various stages of the coaching journey and building strong working alliances. Additionally, these systems can adapt to the unique needs of each user. Nonetheless, the study highlights that complete substitution of human coaches by AI is improbable and human coaches play a vital role in the initial stages of the coaching process as AI is not yet fully capable of comprehending the underlying needs and goals of users, if implicit or not communicated clearly by them. According to the authors, the use of AI in coaching holds the promise of revolutionizing the coaching industry, presenting a cost-effective solution that can reach a wider range of users. As a result, AI coaching has the potential to become a valuable tool in the field of HRD (Terblanche, 2020), democratizing coaching processes in an effective and efficient way, like confirmed also by Terblanche *et al.* (2022a). Three are the factors that influence adoption of AI coaching chatbots: performance expectancy, facilitating conditions, and social influence (Terblanche and Kidd, 2022). In addition, the use of chatbots as coaches provides an added benefit of anonymous interaction, particularly in situations where sensitive information may be disclosed (Terblanche, 2020).

Further optimistic results on AI coaching performance and efficacy are those of Terblanche *et al.* (2022b): the study involved a comparison between human coaches and an AI chatbot coach. The results showed that both types of coaches were effective in helping users reach their goals, and the AI coach was as effective as human coaches by the end of the trials. This discovery has significant implications, as it suggests that AI coaching could scale coaching services and potentially grow demand for human coaches, while also potentially replacing human coaches with simplistic, model-based methods. At present, however, like stated also in Graßmann and Schermuly (2021), AI lacks empathy and emotional intelligence, which render human coaches not completely replaceable.

Finally, Ellis-Brush (2021) exhibits less enthusiastic results with respect to those in Graßmann and Schermuly (2021), since he found that although an AI agent can deliver positive outcomes through a conversational coaching process (e.g., with an improvement in self-resilience), a working alliance between the coachee and the AI coach has not been developed.

Cluster #4-yellow (*AI in HR recruitment and training*) exhibits a strong overlap with Cluster 2. Stachová *et al.* (2019) for example draw similar conclusions to those of Sima *et al.* (2020) from the analysis of the challenges and trends of personal development and education in the 4IR scenario. Indeed, the authors confirm the view that “*Industry 4.0, and in particular automation that interferes with multiple processes and professions, gradually changes employee education and skills requirements*” (Stachová *et al.* 2019, p. 13). This idea is also supported by Caputo *et al.*, (2019), with regard to firms’ investments in Big Data and by Wijayati *et al.* (2022), with regard to AI in workplace.

Perhaps the most relevant contribution in Cluster 4 from a managerial perspective is that of Maity (2019), who proposed a model to identify future trends of AI in HR training and development processes. According to the author, the use of AI in knowledge management and employee training and development is becoming increasingly important for organizations. To stay competitive, companies need robust knowledge management practices that are easily accessible to all employees. AI is also playing a crucial role in shifting training and development from classroom-based programs to personalized, intuitive, and adaptive mobile learning experiences. AI has the potential to identify individual learner characteristics and design training programs tailored to those characteristics, which is crucial for meeting the current need for individualized training programs. From a technical point of view, instead, this cluster hosts different contributions to solve the issues of personnel selection and competence improvement (Chuang *et al.*, 2020; da Silva *et al.*, 2020; Michalopoulos *et al.*, 2022; Zhou *et al.*, 2022), to propose to employees alternative training scenarios (Kantola *et al.*, 2011) and to evaluate the success of training initiatives (Kalinouskaya, 2022).

Cluster #5-violet (*AI in soft skills development*) is in a sense complementary to Cluster 2, as most contributions deal with AI and the assessment and development of soft skills in the context of 4IR also, but not exclusively, in the field of education. Indeed, these papers appear to be more market-oriented and anchored to the organizational reality of companies. Colombo *et al.* (2019), for example, found that soft and digital skills tend to moderate the job displacement effects of automation technologies even in highly automatable sectors, complementing the use of machines and software, and “*making the job less substitutable*” (Colombo *et al.* 2019, p. 35). Of an entirely different nature is the work by Sayfullina *et al.* (2018), who propose several approaches based on a Neural Networks model to match soft skills required by job postings and those present in candidates’ CVs. Their proposal offers an effective solution for firms looking to automate the initial phase of candidate evaluation, as the model can effectively disambiguate the soft skills matching process and reduce false positives significantly. This work provides an innovative solution for HR departments looking to streamline their recruitment process and make more informed decisions based on the skills and characteristics of potential candidates. Likewise, the work by Wings *et al.* (2021) presents a practitioner-oriented nature, and is aimed at the automatic classification and extraction of hard and especially soft skills from candidates’ CVs. It starts from the same technical assumptions but achieves a broader purpose instead the study of Chang *et al.* (2022), who, leveraging NLP and ML techniques, develop a skills extraction algorithm that can be used to analyze student skills, university course syllabi, and online job postings. By analyzing different data sources, the authors provide an initial landscape of skill needs for specific job titles and conduct a within-sector analysis based on programming jobs, computer science curriculum, and undergraduate students. They find that students have a range of hard and soft skills, but they may not be the ones desired by employers. Additionally, they observe a discrepancy between the skills taught in university courses and those in demand by industry, with a lack of emphasis on soft skills. These findings highlight the importance of aligning university curriculums with the needs of industry to ensure that students are well-prepared for their future careers (Kosarava, 2021). In line of the development of more practitioner-oriented AI tools and models stand the contributions by Pasikowska *et al.* (2013) and Schutt *et al.* (2017), who propose chatbots and virtual environments enriched by AI techniques directed respectively to patients with mental health issues and health professionals in training.

5. Conclusion

The implication of the integration of AI into the domain of Personal and Human Resource Development are manifold, and the shifting to the new HR 4.0 paradigm presents both opportunities and challenges for organizations and society as a whole. Following the guidelines by Donthu *et al.*, (2021), we carried out a bibliometric analysis to identify the structure of topics of AI in HRD field.

The structure includes a range of topics that cluster into six main groups: AI in students' skills development; AI Coaching with chatbots; AI and HR analytics; AI and future skills development; Industry 4.0 and contextual factors; Fuzzy logics in HR recruitment and training.

Thus, AI has the capability to optimize various HRM processes, such as recruitment, performance evaluation and employee training, by enabling HR professionals to make more data-driven and impartial decisions and provide valuable insights into employees' behavior and preferences. Despite its potential advantages, the adoption of AI in HRM must be approached with caution, considering factors such as data privacy, potential biases in algorithms, and ethical implications of the replacement of human workers with AI systems. Thus, a balanced and well-informed evaluation of the benefits and limitations of AI implementation in HRM is crucial to ensure its responsible and ethical deployment.

5.1 Theoretical and institutional implications

Based on the findings, we offer three theoretical and institutional implications for advancing further research on the AI in HRD literature.

First, our findings enable researchers to understand the scope of research in this domain and how these domains can be evaluated by a cross-fertilization perspective. Researchers may use our results to explain the adoption of AI in HRD using other literature such as that from the educational domain.

Second, our findings provide researchers with critical information on prestigious and influential articles that may be seen as the foundations of this research field. More in details, new gaps to fill are related to: i) education policy and how these factors can influence social, economic, and educational outcomes; ii) labor dynamics regarding to the investigation of the mechanisms of adoption, acceptance, and trust in the educational and employment contexts; and iii) the identification of the key components that should be included in the initial conversation to build trust between the client and the chatbot coach.

Third, our findings highlight ethical issues about the impact of AI on society-wide social sorting and the potential amplification of discrimination and negative effects in the workplace. The impacts of AI adoption include information security, data privacy, drastic changes resulting from digital transformations and job risk and insecurity. Technostress creators among employees include work overload, job insecurity and complexity (Malik *et al.*, 2021). Consequently, a new ethical framework is needed to guide the application of AI in HRD area. Thus, this study calls for the focus of policy makers and professionals engaged in the legal and information technology domains to examine these factors.

5.2 Practical implications

This study's findings may also be of practical interest to companies. Based on the results, we offer three practical implications for managers to facilitate the implementation and adoption of AI in HRD.

First, practitioners may utilize our research to understand the broad scope of AI's applicability in HRM processes and operations across diverse sectors and managerial domains (Lee *et al.*, 2021; Schermuly *et al.*, 2021).

Second, these practitioners may apply the findings of prestigious studies to discuss the design choices and trade-offs that may address major hindrances in AI's implementation in HRD. For example, further investigation is required to determine the optimal balance between human-like features and transparency about limitations. Factors that need consideration are: i) personality type of the user; ii) the level of humanness and anthropomorphic behavior displayed by the chatbot; iii) the appropriate use of user input and predefined options; iv) the setting of realistic expectations through the initial conversation; and v) the role of various other factors in technology adoption (e.g., trust).

Third, the findings imply the need to practically investigate the role of university to adopt AI in the educational programs to facilitate students' transition to workforce.

5.3 Limitations

The present review shows some limitations that should be considered.

Firstly, the scope of the study was limited to articles published in the Scopus database, which is one of the largest sources of published articles but may still exclude relevant studies that were published in other databases such as Web of Science or Google Scholar.

Secondly, the preliminary search was also limited to scientific documents written in English and excluded other languages. This may reduce the generalizability of the results and future research in this field may consider including other languages to provide a more comprehensive understanding of the field.

Thirdly, 39% of the full sample of papers was not included by VOSviewer in BCN network depicted in Fig. 5. Because of this, and limited to the analysis of the BCA results, this paper may have provided a partial view of the landscape of the literature concerned with AI in Personal and Human Resource Development. In this regard, however, it is important to mention the safeguard mechanisms put in place by the authors: first of all, the BCA is greatly strengthened by the preliminary thematic analysis (KCA), based on the keywords of the entire sample of papers (including those with missing full text and those not included in the BCN, which provided broad overarching themes that were largely reflected and confirmed by the analysis of BCA results. Secondary to this, but not least, a manual cross-check of the contributions not included in the BCN was carried out to make sure that no contribution relevant to the emerging scientific debate was missed.

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Open Innovation and Social Norms: an integrated framework for the understanding of Trust-based relationships

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Abstract

Framing of the research. *In the current dynamic competitive scenario, permeated by continuous in and out-flows of knowledge between multiple actors - the so-called Open Innovation paradigm, developing trust-based relationships is an organizational imperative for fruitful collaborations and therefore needs proper investigation.*

Purpose of the paper. *This study aims to propose a new framework for the understanding of the role of trust as a key informal mechanism that influences Open Innovation collaborations and shapes their outcomes, bringing together the Open Innovation and the Social Norm perspectives.*

Methodology. *This paper is based on a narrative literature review, extremely suitable to bridge disciplinary perspectives*

Results. *The study sheds light on how to build and manage trust in collaborations, emphasizing the relevance of reciprocity, previous experience, the establishment of an effective reputational system and the use of well-structured licensing tools*

Research limitations. *The main limitation is mostly related to one of the potential downsides of using a narrative literature review that could offer a biased view in terms of the selection and analysis of reviewed papers*

Managerial implications. *This study provides useful seminal insights on how to manage trust in the current OI scenario, proposing actionable tools (e.g. licensing) for organizational actors engaged in OI initiatives to overcome related challenges and fully reap OI benefits*

Originality of the paper. *The originality of this paper relies on the combination of two perspectives on the phenomenon under investigation, namely, the Open Innovation and the Social Norm ones, so far scarcely intertwined, offering a new framing for the understanding of the role of trust in Open Innovation settings*

Key words: *trust; open innovation; social norms; collaborations; relational capabilities; relational quality*

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1. Introduction

The Open Innovation (OI) conversation has been evolving substantially in the last decades, by investigating how OI unfolds in different contexts, depending on firms' features, strategies and objectives (Laursen and Salter, 2006; Lanzarotti and Manzini, 2009; Gassman and Enkel, 2004; West and Borges, 2014; Dahlander and Gann, 2010). Lately, studies have unveiled the challenges related to effective Open Innovation implementation, however, further research is still needed (Mahdad *et al.*, 2020; Cassiman and Valentini, 2016) to understand which elements and processes organizations should consider and eventually leverage, to successfully execute OI processes (Hasche *et al.*, 2017) and fully reap the associated benefits.

This issue is remarkably relevant nowadays as firms are pushed to increasingly open their boundaries and establish collaborations with diverse external parties to sustain their competitive advantage while encountering the hurdle of being exposed to third parties' opportunistic behaviours. In face of this challenge, scholars have started debating about possible enabling factors of inter-firm collaboration. Among others, the relational quality - "the extent to which the partners feel comfortable and are willing to rely on trust in dealing with one another" (Ariño *et al.*, 2001, p. 111) - proved to be extremely crucial in the creation of trust-based relationships, as a mean for smoothing the exchange practices. In other words, a high relational capability represents a source of competitive advantage for interfirm collaborations (Johnson *et al.*, 2004; Lorenzoni and Lipparini, 1999) and, thus, in the deployment of firms' OI strategy. In the same vein, according to Bogers (2010), nourishing the more relational dimension of collaboration is essential to set a fertile environment conducive to knowledge sharing, a crucial antecedent of OI agreements.

In line with these contributions, this paper wants to examine how the concept of *trust* acts as an enabler of OI processes. In doing so, it enriches the extant debate by combining two different streams of literature: the Open Innovation and the Social Norms ones. Based on a narrative literature review¹ - defined as an "informal process of reviewing a literature based on incremental expansion of knowledge on the topic of interest" (Fan *et al.*, 2022, p. 173) - it provides a new framework for understanding, integrating the two perspectives, to shed light on the role of *trust* as a key informal mechanism that influences the relationship quality in OI collaborations and, hence, helps to overcome the challenges of OI implementation (Mahdad *et al.*, 2020; Bogers *et al.*, 2017; Cassiman and Valentini, 2016).

The remainder of the paper is structured as follows: Section 2 provides the theoretical background of the study centred around the concept of *trust* in collaborative settings, with particular reference to the OI and the Social Norms domains. In Section 3, we present and discuss the conceptualization derived from the narrative literature review by integrating the two perspectives. Lastly, Section 4 finalizes the paper, by putting forward major limitations as well as potential directions for future research.

2. Theoretical Background

2.1 Trust in collaboration settings

Traditionally, innovation literature pointed out that *trust* can be regarded as a source of competitive advantage (Barney, 1994) for the realization of successful collaborations between organizations, shaping the exchange environment and setting the proper conditions for sharing. According to Inkpen (1998, p. 225), *trust* can be defined as "the belief that a partner's word or promise is reliable and that a partner will fulfil its obligations in the relationship" (Inkpen, 1998, p. 225) and, hence, "without trust, information exchanged may be low in accuracy, comprehensiveness, and timeliness because the partners are unwilling to take the risks associated

¹ This methodology, not requiring pre-set selection criteria, is regarded as extremely suitable for reviews aimed at bridging disciplinary boundaries and perspectives (Fan *et al.*, 2022; Snyder, 2019) such as the one conducted in this paper.

with sharing more valuable information” not allowing successful partnerships to take place. In the same vein, Dyer and Chu (2003) stated that perceived trustworthiness can reduce transaction costs enhancing the quality of the information exchange. Hence, the process of trust-building figures out to be a crucial step for the realization of successful exchanges, affecting the outcome of interfirm partnering.

In sum, *trust* can be seen as a central enabler of collaboration, especially for the sharing of tacit knowledge (Hardwick *et al.*, 2013), and to deal with the tension between knowledge exchange and protection (Bogers, 2010). Moreover, prior cooperative interactions between partners act as a facilitator of such exchange, constituting a base for inter-partner trust (Gulati, 1995a; Inkpen, 1998; Ariño *et al.*, 2001). This seems also to apply when an experienced partner engages with a partner at his first experience (Inkpen, 1998). In terms of impact, in the case of satisfying prior experiences, collaboration practices positively impact a firm’s attitude toward sharing behaviours and trusting (Gulati, 1995a).

Finally, it is noteworthy to highlight that some authors provided a nuanced interpretation of trust-building in terms of reciprocity (Das and Teng, 1998). The claim “I trust because you trust” (McAllister, 1995; Das and Teng, 1998) reflects the concept of reciprocity, suggesting how relevant the role of the reputation and historical collaboration background of the two parties are. Indeed, a good reputation of a new ally is crucial for decreasing the risk involved in a new partnership (Barney and Hansen, 1994; Das and Teng, 1998; Ariño *et al.*, 2001), and hence increase the trust and the likelihood of a successful collaboration between the parties (Ariño *et al.*, 2001; Ganguly *et al.*, 2019).

As a final remark, all that glitters is not gold, as organizations must acknowledge and cope with the potential “dark-side” of trust. Indeed, an excessive level of trust among partners can be detrimental to the collaboration (Molina-Morales and Martinez-Fernandez, 2009; Gargiulo and Ertug, 2006; Fawcett *et al.*, 2012), involving different types of latent costs and related risks such as internal de-skilling and external dependence, credulity and reduced value generation (Westergren and Holmström, 2012).

2.2 *Open Innovation and Trust*

If trust is deemed fundamental in collaboration settings in general, it is even more significant in the OI context (Chesbrough *et al.*, 2018), where collaborations are characterized by a high degree of heterogeneity among multiple partners, leading to high uncertainty about parties’ behaviours as well as the unfolding of collaboration events. It is acknowledged that in OI settings, firms interact with several different types of actors - such as customers, suppliers, competitors, universities and research centres (Gassman and Enkel, 2004; Laursen and Salter, 2006; Chesbrough, 2020) - each one with specific characteristics and objectives to fulfil. Therefore, developing solid relational capabilities, adequate for each type of multilateral exchange, is the most crucial factor for ensuring a profitable implementation of OI practices. On the contrary, the scarcity of such relational quality and the resulting low level of *trust* between partners may result to be the principal reason for the failure of OI agreements (Mortara *et al.*, 2009).

Under this scenario, recent managerial practices and pieces of work converge to suggest that firms must set the most conducive environment to properly engage with third parties and to successfully manage relationships in a trustworthy manner, in order to reap the potential associated benefits. Hence, especially in OI settings, authors agree that *trust* besides being a crucial enabler of OI processes (Nestle *et al.*, 2019; Brockman *et al.*, 2018; Wilson *et al.*, 2018; Gattringer and Wiener, 2020; Salampasis *et al.*, 2015), it also poses critical challenges to tackle while initiating and executing OI practices effectively (Di Pietro *et al.*, 2021; Osorno and Mendrano, 2020).

In this respect, OI literature has provided several examples of these dynamics. For instance, Santoro *et al.* (2020) emphasize how the entrepreneur’s *trust* towards internal and external OI partners can enhance the adoption of Open Innovation practices, in small and medium enterprises (SMEs). Similarly, discussing the skills of successful leaders in OI communities, Fleming and

Waguespack (2007) underline the importance of being able to build trust-based relationships. Focusing on crowdsourcing, Wilson *et al.* (2018) stress that trust is a key element that pushes individuals to take part in this type of project, even in the absence or in presence of a low-level provision of extrinsic rewards. In the same vein, du Chatenier *et al.* (2010) highlight trust-building as a distinctive individual competence for OI team dynamics.

While the previous findings were related to the individual level of analysis, at the inter-organizational level, *trust* has proved to be an OI key enabler, especially in the context of networking activities (García-Muiña *et al.*, 2019; Nestle *et al.*, 2019) such as in the formation of temporary consortiums (Msanjila and Afsarmanesh, 2009) or within SMEs' ecosystems (Chesbrough *et al.*, 2014). On this topic, Huggins (2010) explains in-depth the concept of network capital, emphasizing that the trust established between partners is not a blind one but rather a more reflective form related to the institutional environment. Hence, firms participate in collaborative agreements to access new external knowledge and increase their returns, looking for economic benefits.

Furthermore, with specific emphasis on the different types of OI partners, D' Este and Salter (2010) point out the importance of inter-organizational *trust* to lower barriers within collaborations between industries and universities. Fuller *et al.* (2008) instead focus on how consumers' brand trust increases clients' willingness to take part in OI projects. Finally, Di Pietro *et al.* (2021), by looking at crowdsourcing practices, found that the absence of trust constitutes one of the major deterrents towards openness, preventing fruitful exploitation of external knowledge, and even initial engagement in this type of initiative.

Given the fragmentation of the extant literature on the topic, and the increasing attention on the enabling factors of OI implementation, Antonelli *et al.*, (2022) provided a systematic literature review, enucleating the *trust enablers* and *effects* in OI settings. For what concerns the former category, both the presence of specific structural elements (at the institutional, organizational and individual level) and the design and adoption of practices and mechanisms to reduce the perceived risk inherent in OI projects' engagement, through the development of benevolence, mutual understanding and the reduction of opportunistic behaviours' convenience, are considered predominant for fruitful OI exchanges. For what concerns the second category, *trust* has proved to be able to increase both OI efforts and success, diminishing OI-associated barriers, in terms of cultural dissimilarities among partners and transaction costs, and helping to diffuse an Open Innovation culture by facilitating resources and knowledge sharing.

To conclude, the reviewed literature on the role of trust in OI settings overall agrees that trust-based relationships are regarded as a key determinant of exchange-based environments, and hence, they are crucial in OI settings (Bogers, 2010; Mortara *et al.*, 2009) and, in turn, essential for firms' success nowadays.

2.3 Social Norms and Trust

Trust is a fundamental aspect of individuals' and societal life since without it, no valuable exchange could occur, not allowing progress to happen. Within the Social Norms literature, Bicchieri *et al.*, (2004) suggest multiple definitions of *trust*. Firstly, it can be regarded as "a disposition to engage in social exchanges that involve uncertainty and vulnerability, but that are also potentially rewarding" (Bicchieri *et al.*, 2004, p. 286). In this case, according to the authors, its appearance in collaboration agreements can be justified by the expectation of trustworthiness that an individual has concerning the involved partner, which in turn depends on the latter's reputation or willingness to protect long-term interests. However, in situations in which there is a lack of information, *trust* assumes the form of "impersonal trust" - described as "a disposition to engage in impersonal social exchanges" (Bicchieri *et al.*, 2004, p. 287). In these cases, potential expectations are adaptive, which means based on past personal experience.

Other studies (Dawes, 1991; Orbell and Dawes, 1991) emphasize another perspective on trusting that can be regarded as norm-driven behaviour. However, based on their experiment, Bicchieri *et*

al., (2011) countered this perspective and proposed that being trustworthy (trustworthiness) can be considered a social norm, rather than the act itself of trusting. And this holds true, also in more familiar contexts. According to their reasoning, there is a strong presence of reciprocity - defined as “a behaviour response to perceived kindness or unkindness” (Falk and Fischbacher, 2006, p. 294) that drives trust-based behaviours. In particular, according to the experiment participants’ responses, there are evident expectations of punishment for trust violations, highlighting that “trust is grounded upon reciprocity norms (...). [Indeed,] we expect those whom we trust to have an obligation to honor our trust” (Bicchieri *et al.*, 2011, p. 181). This was also confirmed more recently by Bicchieri and Dimant (2022), stating that people decide to adopt a trust-based behaviour because they expect others to do the same, and contemporary, suppose that others believe they should adopt that specific behaviour.

Another relevant contribution to the topic of *trust* and reciprocal expectations is the one provided by Duffy *et al.* (2013) which investigates whether this mechanism also applies to interactions between strangers. What emerges is that, in two-player sequential trust games, high levels of trust and reciprocity are enabled by the availability of rich reputational information about the exchange partner. More in detail, longer tracking histories lead to more optimal results, and, additionally, the provision of information at a small cost increases the establishment of trust and reciprocity-based sharing behaviours. Thus, both trust and reciprocity are regarded as crucial factors in human behaviours, especially when it comes to information-exchange mechanisms, both in more familiar and unknown interactive contexts.

From a different angle, Bicchieri *et al.* (2011) point out that trusting may be a behaviour “that is predicated on the anticipation of profit through reciprocation” (Bicchieri, Xiao and Muldoon, 2011, p. 171). If there is no expectation of shared benefits through collaboration, no valuable exchange could happen (Bicchieri, Xiao and Muldoon, 2011), highlighting a more egoistic connotation of reciprocity. This contribution is coherent with the mainstream literature (e.g. Gouldner, 1960; Selznick, 1992) suggesting that reciprocity could be seen as a driver to satisfy selfish aspirations, increasing the probability of receiving future advantages (Deckop *et al.*, 2003). However, even if reciprocity can hide this egoistic nuance, it nevertheless unfolds in societies as a moral norm, going beyond self-driven motivations. This duality also emerges from the research of March and Olsen (1995), according to which, individuals in organizations can use the logic of appropriateness as a basis for decision-making, relying on past experiences, consolidated procedures, beliefs and legitimate norms rather than adopting the logic of consequences, merely calculating the expected returns of each option. These two alternative logics, consequences of limited rationality, can also be seen as distributed in a continuum, and hence, alternatively utilised in decision-making processes. Action, in fact, in some cases can follow the logic of appropriateness, relying on prior experience, whereas, in others, can be based on possible future effects, adopting the logic of consequences (Schulz, 2014). Thus, also reciprocity-related behaviours can reflect this dual perspective configuring themselves as more normative or opportunistic.

3. Bringing together Open Innovation and the Social Norm perspectives to understand trust in OI settings

The extant literature on trust has usually under-investigated how it can be translated from an individual level to an organizational construct (Nielsen, 2004). Indeed, “it has often been argued that individuals, not organizations trust. However, individuals act within institutional and social contexts (institution-based trust), which introduce a degree of ambiguity about the multilevel and multidimensional nature of trust” (Nielsen, 2004, p. 241). This increases the risk of “cross-level fallacy” (Rousseau, 1985). Nevertheless, in this paper, to overcome this ambiguity, an embedded perspective has been adopted (Lumineau and Schilke, 2018), pointing out that the link between inter-organizational and interpersonal trust is based on institutionalizing processes (Zaheer *et al.*, 1998). In particular, the framework upon which this study relies follows the embedded-agency

approach (Lumineau and Schilke, 2018; Barley and Tolbert, 1997; Seo and Creed, 2002), according to which are not only broad institutions to influence individual-level choices but also the opposite, in a reciprocal relationship (Cardinale, 2018). Hence, “the idea of embedded agency implies the existence of two types of concurrent cross-level effects” (Lumineau and Schilke, 2018, p. 240), which are: top-down (from the organisation to individuals) and bottom-up (from individuals to the organisation) (Lumineau and Schilke, 2018). Therefore, in this study, we will focus on the bottom-up side of trust-building processes, supporting that “individuals’ trust perceptions can ‘spiral up’ and diffuse from the individual to the organisational level” (Lumineau and Schilke, 2018, p. 243), adopting social norm lenses.

As already anticipated, according to Bicchieri *et al.*, (2011), there is no difference in normative beliefs on trusting between interactions that take place within close relationships rather than with strangers. Hence, trust is not regarded as a social norm, either in more familiar contexts. For this reason, preferring repeated interactions with the same partner to ensure the establishment of trust (Gulati, 1995a; Inkpen, 1998; Ariño *et al.*, 2001) is not necessarily preferable, under the social norm perspective. Additionally, this behaviour can reduce the power of OI agreements, incentivizing relationships only between fixed and already known partners, eventually leading to over-dependence. Instead, what emerges to be fundamental is the provision of a reputational system (Duffy *et al.*, 2013) - applicable also in OI contexts. In two-player sequential trust games, high levels of trust and reciprocity are enabled by the availability of rich reputational information about the exchange partner. This result is coherent with the idea that for establishing trust-based relationships the concept of reputation is crucial (Barney and Hansen, 1994; Das and Teng, 1998; Ariño *et al.*, 2001). Indeed, Gulati (1995a; 1995b) affirms that “networks of prior alliances can enhance trust both by providing information to partners about each other’s reliability and by reinforcing a concern for reputation” (Gulati, 1995b, p. 623), generating proper reputational circuits that enhance ties between potential partners. In this light, we argue that is not only the existence of a shared previous experience that enhances trust in OI processes but rather the availability of information about the partner’s reputation, whether it comes from a direct or indirect source. This leaves open the possibility of creating OI fruitful collaborations also with new partners and obtaining positive outcomes, even in first-time alliances. As further evidence of this argument, Lopèz-Pèrez (2008) highlights that it is a firm’s previous experience with alliances to play a role in its attitude toward trust and sharing behaviours in collaborations governance (Gulati, 1995a; Inkpen, 1998), rather than a common past collaboration experience between partners.

Given that “trust is grounded upon reciprocity norms” (Bicchieri *et al.*, 2011, p. 181), to better grasp our contribution, we recall the abovementioned concept of reciprocity underlying collaborative agreement. As for single agents, organizational action can also swing between the fulfilment of the logics of appropriateness and consequences, depending on the context (Schulz, 2014). However, regardless of the chosen logic, when reciprocity unfolds, whether for opportunistic reasons or more normative ones, enhancing trust-based behaviours, the probability of successful collaborations raises.

Another important consideration to make is that trust and reciprocity can be also strengthened by the use of more formal contractual measures that regulate the output of the exchange between organizations. For instance, licensing can be described as a fundamental tool to increase trust and confidence in collaborative agreements, defining the contribution of each partner to the exchange. Licensing strategies can be used to guarantee companies intellectual property rights-related benefits, constituting an incentive to innovation, without excluding third parties from the underlying knowledge, making clearer the reciprocity at the base of the exchange. In this regard, the inclusion of the grant-back clause can be understood as a tool for strengthening reciprocity (Davenport and Prusak, 1998; Ganguly *et al.*, 2019) between the licensor and the licensee, as the former imposes the obligation on the licensee to assign to the licensor the future rights on the progress or improvements of the technology obtained under the license, generated during the term of the contract (Leone and Reichstein, 2012). In the same vein, Bogers (2010) stressed that licensing can be seen as a proper mechanism to help to cope with the natural tension between knowledge sharing

and appropriation. Indeed, it offers the possibility to protect the firm's knowledge, reducing moral opportunism and unexpected spillovers - hence, enhancing trust - while, still allowing the exchange to take place.

All that said, it is evident that there is room for building and developing a complementary view on OI collaborations, by bringing together the Open Innovation and the Social Norms perspectives, centred around the concept of trust and reciprocity. Indeed, this new framework of understanding is of particular relevance and impact, when it is applied to collaborative settings, and specifically to OI contexts where “often [...] less formal contractual measures [are involved], hence implying an inherent need for trust-based relationships” (Nestle *et al.* 2019, p. 564).

4. Conclusions, limitations and future research

Nowadays, to sustain their competitive advantage, organizations are called to create and develop effective strategic alliances, opening their innovation funnel through the adoption of OI principles. In OI contexts, firms must be confident regarding their partners' behaviours, hence, they have to trust each other for sustaining strong and worthy relationships, posing several challenges in terms of the development and deployment of relational capabilities to establish trust-based relationships.

In line with the actual trends of the OI literature, this paper highlights the relevance of *trust*, as a key enabling factor of OI processes. Nevertheless, to the best of our knowledge, it constitutes the first attempt to integrate a norm-based perspective into the OI discussion, hence, providing useful seminal insights on how to manage trust in the current OI scenario, for instance, through the establishment of a reputational system, the use of well-structured licensing tools and emphasizing the role of reciprocity and previous experience to increase positive outcomes.

The main limitation of this study is mostly related to the narrative literature review methodology. Indeed, on one hand, it allows to create a detailed discovery-driven narrative around the topic of interest (Fan *et al.*, 2022) and is considered extremely suitable for domains' boundary-crossing reviews (Fan *et al.*, 2022; Snyder, 2019), coherently with this paper objective. On the other hand, it may offer a biased view in terms of the selection and analysis of the reviewed papers (Tranfield *et al.*, 2003), considering “its informal and incremental nature” (Fan *et al.*, 2022, p. 172). To overcome this limitation, future studies could enrich the present analysis, by utilizing more inclusive criteria or situating the debate in an empirical setting.

In addition to that, we are aware of the risk of ecological fallacy (Grabher and Ibert, 2006) related to this type of multi-level studies, combining different units of analysis. Indeed, this research strongly recognizes the differences that can occur between interpersonal and inter-organizational trust. However, it assumes that, despite the existing differentiation between individual and organizational trusting behaviours, the individual level can influence the organizational one, as also stated by the extant literature (Lumineau and Schilke, 2018; Barley and Tolbert, 1997; Seo and Creed, 2002; Cardinale, 2018), through the application of a bottom-up perspective (Lumineau and Schilke, 2018).

Finally, as the aim of the paper is to investigate how trust unfolds in OI contexts, through the lens of the Social Norm perspective, future studies could empirically investigate (e.g. through experiments) how trust affects organizational OI practices implementation, through the establishment of trust-based relationships between partners. As a final remark, future works could also explore, at the theoretical and empirical level, the “dark-side” of trust (Gargiulo and Ertug, 2006) in OI settings, to enrich the discussion and offer a comprehensive overview of the topic under investigation.

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Are consumers' food purchase intentions impacted by blockchain technology?

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Abstract

Framing of the research. Consumers are increasingly concerned with food products' authenticity and traceability. Blockchain technology (BCT) enables end-to-end traceability to the food supply chain, accessible to consumers through their mobiles.

Purpose of the paper. The study aims at understanding consumers' knowledge and factors affecting the intention to adopt the BCT when shopping for food. A model based on an integrated version of the TAM is verified.

Methodology. A survey based on a structured questionnaire was digitally shared among consumers. 392 responses were collected; PLS-SEM was used to verify the proposed model on the sample of knowledgeable consumers (N: 120).

Results. The level of knowledge of the BCT is very low (31% of the sample). Perceived usefulness (PU) and perceived ease of use (PE) influence the attitude-intention to adopt path. The technology principles knowledge impacts PU, PE, and blockchain guarantee, while the latter positively impacts on attitude. Indirect effects are all verified.

Research limitations. Due to the novelty of the phenomenon, the sample is small as the study focused only on knowledgeable consumers, limiting the generalizability of results. Cross-cultural studies may improve our knowledge.

Managerial implications. Our results are useful to supply chain members and especially to managers of manufacturing and retail companies willing to provide solutions to guarantee authenticity and traceability to consumers, but also to institutions aimed at protecting their citizens.

Originality of the paper. The BCT studies are mainly focused on the firm side, while little data or insights on the consumer side are available.

Key words: blockchain technology; consumers' purchase intentions; blockchain guarantee; technology principles knowledge; technology acceptance model; structural equation modeling

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1. Introduction

Consumers are increasingly concerned with food products' authenticity, traceability, and safety. Therefore, tracing and verifying food products' origin and production phases have become critical activities for all the companies involved in the supply chain in order to guarantee consumers. To cope with traceability issues and to safeguard transparency, the blockchain technology (BTC) stands as particularly useful for its capacity to store food data in chronological order making impossible their manipulation afterward (Galvez et al., 2018).

Blockchains allow end-to-end traceability to the food chain as *“information is tied digitally to each individual product, creating a digital record to prove provenance, compliance, authenticity, and quality. This information follows the product throughout the supply chain and is accessible to every stakeholder”* (Bumblauskas et al., 2020, p. 1). In this way, even consumers are enabled to access the story of foods through their mobiles. This has led some authors to far-sighted considered the blockchain as *“the tech most likely to change the next decade of business”* (Tapscott and Tapscott, 2016, p. 2). Previous food scandals have made consumers more sensible and aware of what they buy and eat (Liu et al., 2019) and lots of them use technology to find out information about food items and/or the retailer or brands that sell them. This is impacting on the food industry, leading retailers, and manufacturers to introduce better schemes to reduce information asymmetry, in particular labelling and traceability systems. In Europe, for example, heavy antibiotics usage as well as gene feeding and poor information about farming conditions have generated criticisms among the public opinion. Thus, providing consumers with a technology as the Blockchain able to give them empowerment to get information about the product's origin and feeding methods easily, allows consumers to feel more secure when purchasing food (Sander et al., 2018). The market information asymmetry can sometimes let suppliers or retailers to undertake in opportunistic behaviors, making consumers paying the consequences - economic but also sanitary and in terms of health - for that; this is why, a Blockchain-traceability system has the potential to be welcome by consumers (Lin et al., 2021). Even though labelling schemes already provide consumers with useful information, the implementation of a food traceability system could really enhance the transparency of the food industry, since the entire supply chain stages can be monitored, offering a reliable continuous flow of information to consumers (Fuzesi et al., 2020).

However, to effectively implement the BCT, it is important to develop consumers' awareness about the existence and benefits they can get from the use of this technology and map the determinants that influence its acceptance by end-users. Though, the literature on BCT - even flourishing - is strongly addressed to the “firm” side, with particular attention posed on analyzing benefits and impacts on the supply chain (Gurtu and Johny, 2019) or any specific players of it - such as, retailers (Saxena and Sarkar, 2023). The paucity of research studies focusing on consumer intentions to adopt BCT when purchasing food is at the root of this study. As a matter of fact, *“individual actions toward such advanced technology are imperative to be observed to evaluate its scalability”* (Kumar and Upreti, 2022, p. 2). Within this framework, considering that few studies or insights on the consumers side of the phenomenon are currently available, the objective of this study is to understand the level of consumer awareness of the Blockchain and specifically determining consumers' perception of it when shopping for food. To achieve these objectives, an integrated version of the Technology Acceptance Model (TAM) has been used, testing a model in which the role of technology principles knowledge (TPK) is key in order to indirectly stimulate consumer intentions to adopt the BCT when shopping for food. In addition, this is performed exploring the mediation effect of blockchain guarantee (BG).

To verify the proposed model, a survey based on a structured questionnaire was performed, digitally sharing it among consumers; data were subsequently processed through structural equation modelling techniques. To our knowledge, no studies have been conducted on Italian consumers until now to this regard, despite their highly recognized level of concern about the provenance and quality of the food they eat/buy (Menozzi, 2015). As a matter of fact, the acceptance of emerging

food technology varies depending on the technology and across countries (Ashraf et al., 2014), requiring a focus on a specific cultural context.

The paper contributes to the literature on technology management and consumer behavior, evidencing the importance of integrating the TAM model with constructs supporting the principles of the technology and service attributes, such as BG. The results obtained may also be useful to managers of manufacturing and retailing companies operating in Italy and willing to anticipate consumers' needs and provide solutions on this regard, soundly aware of the factors which may lead to BCT adoption.

Our research questions are as follows: Do Italian consumers know the Blockchain? Do they intend to use it when purchasing for food? What is the role of TPK and BG in affecting consumer adoption of Blockchain in a TAM perspective?

The paper is structured as follows. After a brief description of the evolution of the literature on blockchain, the theoretical framework and hypotheses supporting the proposed model are described, followed by the methodology used to fulfil the study. The research design, measurements and model validity sub-paragraphs are provided before presenting the results obtained and discuss them in the light of the related theoretical and managerial implications. Limitations and further research avenues end the paper.

2. Blockchain: a literature in evolution

Blockchain technology implementation can take place on several sectors, such as the financial one, or the services sector and so on. However, at its early stage of diffusion, the main implementations of this technology have been in the food supply chain sector, since it provides value for both retailers and producers, but also for the end consumers. The phenomenon, which immediately acquired a particular interest and application in cryptocurrencies and financial services and then in the information technology and B2B relationship literature (Alt, 2020), has subsequently been considered - among other technologies - for its disruptive impactful in several business models (Jain et al., 2021).

Actually, the BTC can be used in order to: store and share data relative to all the players involved in the supply chain; provide wide visibility to who is performing what activities, where, and when (Kshetri, 2018); to bypass intermediaries and auditors, enabling lower costs and increased efficiency (Kshetri, 2018; Tonnissen and Teuteberg, 2019); to prevent fraud.

The benefits of BCT do not stand only on food supply chain traceability: the increasing search for environmental sustainability calls for foods with a lower environmental impact and this is strictly connected to the introduction of effective traceability technologies ensuring the integrity of the information provided.

Focusing on the retail industry, a few studies have explored the facilitator role of the blockchain in the industry (e.g., Chakrabarti et al., 2017; Chen et al., 2020; Miraz et al., 2020), without, however, considering the primary role that the blockchain can play in managing the relationship between retailers and consumers. Nevertheless, the relevance of blockchain in consumer marketing is undoubtful (Jain et al., 2021). This is confirmed by the recent study of Kumar et al. (2022), shedding light on the relevance that blockchain technology may have in providing information about the product origin and track the product's history in the pre-purchase phase. However, the spread of blockchain in current consumption and purchasing processes is strongly limited by the poor knowledge on the existence and benefits of the technology possessed by consumers. Wang and Scrimgeour (2022) evidenced the current knowledge gap regarding consumer adoption of blockchain food traceability. They explored the influence of a number of factors on consumer adoption of blockchain food traceability in New Zealand, finding out that consumer adoption of blockchain food traceability was significantly influenced by two innovation-adoption features - perceived incentives and perceived complexity, as well as their expertise in food traceability. This is why our study proposes a model offering a framework in which consumers' knowledge of the

functioning of the blockchain technology and the guarantee benefit brought by adopting it constitute key antecedents to support adoption, as the next paragraph depicts.

3. Theoretical framework and hypotheses

The technology acceptance model (TAM) is widely used in asserting users' acceptance of an innovation in a given context. The framework was introduced by Fred Davis in 1985 in his doctoral thesis, as an evolution of the Theory of Reasoned Action (TRA) (Ajzen and Fishbein, 1975). Davis stated that the use of an information system (and in view, the acceptance of a technology) derives from the user's attitude towards that system - considered to be a major determinant - and that this, in turn, is determined by two constructs: Perceived Usefulness and Perceived Ease of Use.

According to Kulviwat (2007), Perceived Usefulness (PU) is the belief of the person regarding the perceived likelihood that the technology will benefit the person in performing a given task, increasing the likelihood of adopting it in the future. In our model, PU of the Blockchain when purchasing for food concerns all those aspects related to the traceability and provenance ascertainment. Indeed, for consumers, having easily access to a technology that allow them to determine the status and quality of a food item when shopping for food is assumed to be useful and desirable. Therefore, we can postulate the following hypothesis:

H1: Perceived Usefulness positively impact Attitude towards Blockchain adoption when purchasing for food.

Perceived Ease of use (PE) is defined as "*The degree to which an individual believes that using a particular system would be free of physical and mental effort*". It can also express the effort required by the individual to benefit from a given technology and in the literature it is recognized as the second most important variable for predicting the intention to adopt a certain kind of technology. It affects perceived usefulness and attitude directly, and through these variables it indirectly impacts intention to use. Indeed, if a given technology is perceived easier to use for achieving a certain goal, then it will also be perceived as more useful (Ursavaş, 2022). Perceived Ease of Use generally represents how much easy and enjoyable a new technology is perceived: the easier and more enjoyable a technology is, the more likely consumers may be prone to adopt it. Additionally, according to Davis (1985), the more consumers perceive an innovation to be easy to use, the more they will find benefits from using it and therefore, the innovation will be perceived as more useful as well. Two further hypotheses are then derived:

H2: Perceived Ease of Use positively affects Attitude towards Blockchain adoption when purchasing for food.

H3: Perceived Ease of Use positively affects Perceived Usefulness.

In this study, an integrated version of the TAM is used, in which the Technology Principles Knowledge construct activates a positive attitude towards the investigated technology - and, in so doing, the intention to shop for food using the blockchain technology - through the mediating effect of PU, PE and BG. Knauer and Mann (2019) introduced this construct in the TAM model, considering it as referred to the tendency that people display when looking for new information about an innovation, before actually using it. Translating this conceptualization in the specific context of the current study (the role of technology when purchasing for food), consumers who already heard about Blockchain and who already know its features and potential benefits, are likely to perceive the technology to be useful, easy and enjoyable. Indeed, knowing the benefits that arise from using a decentralized technology in a context - as shopping for food - where information asymmetries are always present, positively impacts users' perception of the Blockchain.

The following hypotheses are developed:

H4: Technology Principles Knowledge positively affects Perceived Usefulness.

H5: Technology Principles Knowledge positively affects Perceived ease of Use.

Decentralization and the immutability features of the Blockchain are essential in giving assurance to consumers when it comes to purchase food items, since having all the information available of a food item and knowing its history in terms of origin and production stages without the risk that anyone in the supply chain can modify them can lead consumers to feel safer and guaranteed in performing the shopping task. Rainero and Modarelli (2021) performed an analysis assessing consumers' poor knowledge and perceptions on the BC and the scarce usage level, but evidence also that consumption habits could change through security and certainty antecedents, induced knowledge provided by external technological intervention. As the level of trust in a technology is determined by the quality of the technological infrastructure (Koenig-Lewis et al., 2010), we can postulate a positive impact of knowing the functioning of the blockchain technology in guaranteeing consumers, as posited by the next hypothesis:

H6: Technology Principles Knowledge positively affects Blockchain guarantee.

The role of technology as a tool able to act as a guarantee for consumers has been supported in the literature (Robertson et al., 2012). In the specific context of this study, the trust protocol of blockchain guarantees consumers (Rejeb et al., 2020) and act as a boundary condition (Behnke and Janssen, 2020). The higher the level of perceived guarantee played by a technology solution, the more positive is the attitude of a consumer in using a technology as the Blockchain - where all information about the given products are provided and immutable - when buying for food.

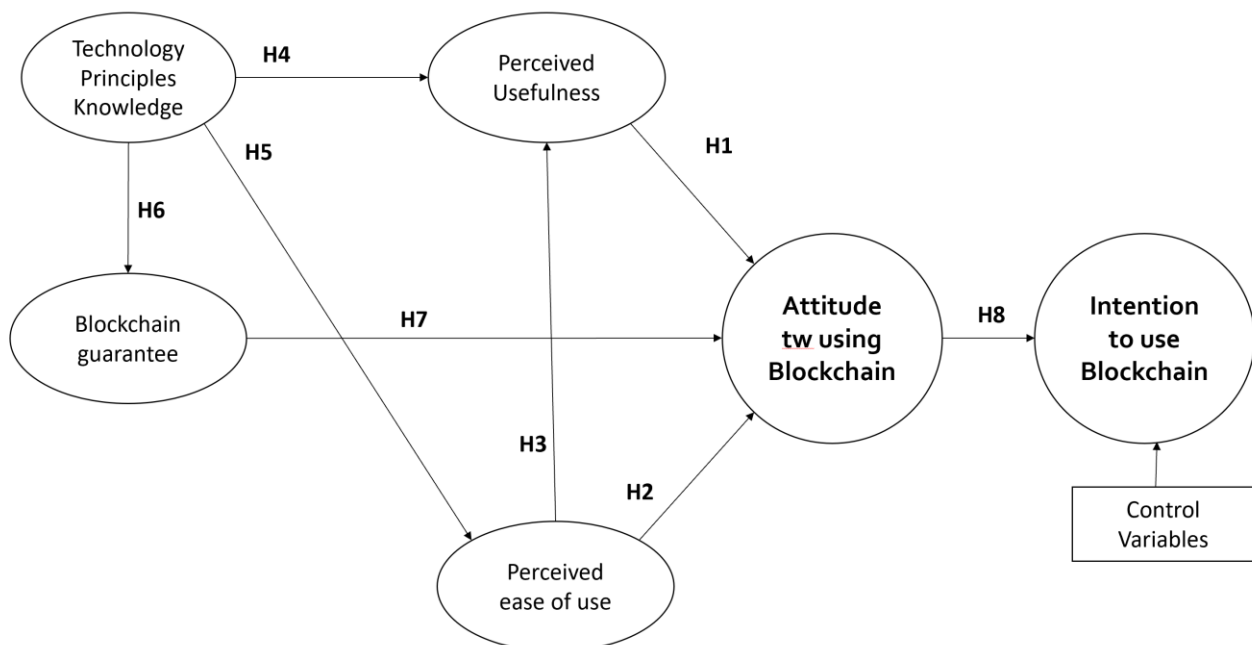
H7: Blockchain Guarantee positively impacts attitude towards using Blockchain.

Lastly, Attitude towards using the Blockchain is the main factor that influence consumers to adopt a given technology. Theoretically speaking, a positive attitude is positively related to intention to use a technology (Davis, 1985) and on other studies on different types of technologies, this relationship was found to be empirically significant. Therefore, we would like to verify the same path when the blockchain technology is employed:

H8: Attitude towards using Blockchain positively affects Intentions to use Blockchain technology when shopping for food.

Due to the novel topic, demographics may greatly improve the model performance. Accordingly, we included gender and age to the theoretical models to extend our results.

Fig. 1: Theoretical model



Source: our elaboration

4. Methodology

4.1 Research Design

A deductive approach based on a quantitative method was designed to verify the proposed model and relative hypotheses. A survey based on a structured questionnaire was developed on a Google form and shared among potential users of the blockchain technology when shopping for food products in November 2022. The link to the online questionnaire was shared on a number of Facebook groups interested to discuss on food and grocery retailing. Consumers potentially involved in sharing their opinions about products, and showing a significant interest in retailers' innovation were invited to participate. To strengthen the diffusion of the questionnaire, fifteen consumers associations officially recognized by the Italian government (mise.gov.it) were contacted; among all of them, only the "Movimento Difesa del Cittadino", committed itself to spread the questionnaire to all its associates. To avoid potential biases, no reward was given to respondents.

The structured questionnaire is composed of two main parts: the first investigates the main demographic characteristics of respondents, while the second measures the constructs proposed in the theoretical section.

In one month, we collected 392 responses - demographics are reported in table 1.

Tab. 1: Demographic characteristics of respondents

<i>Measure</i>	<i>Items</i>	<i>N (392)</i>	<i>n (120)</i>
Blockchain knowledge (Do you know about the blockchain technology?)	Yes	120 (30.61%)	
	No	272 (69.39%)	
Gender	Male	109 (27.81%)	79 (65.83%)
	Female	283 (72.19%)	41 (34.17%)
Age	18-25 years old	99 (25.26%)	71 (59.17%)
	26-35 years old	60 (15.31%)	18 (15.00%)
	36-50 years old	135 (34.44%)	14 (11.67%)
	51-65 years old	89 (22.70%)	16 (13.33%)
	Over 65 years	9 (2.30%)	1 (0.83%)

Source: our elaboration

The first aim of our study is to understand the level of knowledge of the blockchain technology among consumers. Considering the overall sample, a first information emerging is that only one over three respondents know about the existence of the blockchain technology. Although the overall sample was mainly composed of female (72.19%) the reduced sample based on respondents knowledgeable about the blockchain is mainly based on male (65.83%) showing a wider awareness of the emerging phenomenon for men. Similarly, while the overall sample shows a heterogeneous distribution in age groups - only the eldest cluster is poorly represented - the representativeness of the age groups of those who know the blockchain technology decreases as age increases.

As the scope of the study is to investigate how the blockchain may influence the intention to shop for food by the support of the blockchain, the following empirical analysis is developed only on respondents who knows the blockchain. Thus, the empirical analysis has been conducted on 120 questionnaires.

4.2 Measurements

Table 2 presents the main measures derived from the consumer behavior literature. Questions were adapted to the context of our study. Items were translated in the Italian language to simplify

the response of survey's participants. Data were measures through a five-point close-ended Likert scale.

The scale of Technology Principles Knowledge (TPK), comprising of three items, was derived from the previous study of Knauer and Mann (2020) as well as the construct of Blockchain Guarantee (BG), composed of four items. Perceived Usefulness (PU) and Perceive Ease of Use (PE) were adapted from the original scale developed by Davis (1985) and the recent study of Kumar et al. (2022). Attitude towards the use of Blockchain (A) and the Intention to use to Blockchain while shopping for food (I) scales were derived and adapted from Albayati et al. (2020).

Tab. 2: Measures

<i>Construct</i>	<i>Items</i>	<i>Standardized factor loading</i>	<i>T-statistics</i>
Technology Principles Knowledge	TPK1: I know how the Blockchain technology works.	0.885***	22.487
	TPK2: I know the advantages of a decentralized technology as the Blockchain in comparison to a centralized one.	0.902***	39.156
	TPK3: I have already heard of Blockchain applications in food retailing.	0.789***	18.005
Blockchain Guarantee	BG1: I would be in favor of using the Blockchain technology to know the traceability of a food item after a food hazard.	0.853***	25.078
	BG2: I would be in favor of buying a new product if I could be assured that it does not contain virus or bacteria (e.g., Salmonella).	0.769***	12.871
	BG3: I think Blockchain technology ensures the integrity of the provided information about a food item.	0.867***	29.630
	BG4: The usage of the Blockchain in food retailing makes me feel safer when I purchase a food item.	0.797***	18.890
Perceived Usefulness	PU1: I think that using the Blockchain technology to track information about a food item is useful.	0.842***	25.256
	PU2: I think that the Blockchain technology can help me understand the real provenance of a food item.	0.850***	27.195
	PU3: I think that the usage of the Blockchain technology can help me understand the quality of a product compared to another.	0.837***	27.930
	PU4: I think that the usage of Blockchain can speed the process of choosing a product compared to another.	0.708***	14.038
	PU5: I think that the data immutability characteristics of the Blockchain is important in the food retailing sector.	0.848***	31.555
Perceived Ease of Use	PE1: I think that scanning a QR code Blockchain based with the smartphone to access real time information about a food item does not require much time.	0.723***	12.128
	PE2: I think that learning how to use the Blockchain technology in the food retailing sector through scanning a QR code is easy.	0.895***	40.694
	PE3: I think that the usage of the Blockchain through QR code is clear and intuitive.	0.909***	46.890
	PE4: I think it is easy for me to find the information I am looking for about a food item through the Blockchain traceability system.	0.811***	20.704
Attitude towards using blockchain	A1: I am in favor of using the Blockchain technology to track food items history.	0.934***	42.073
	A2: I think that the usage of a QR code Blockchain based to track information of food items is a good idea.	0.955***	78.588
	A3: It makes sense to use the Blockchain technology to track food items history.	0.951***	65.984
Intention to use blockchain for shopping	I1: I would be in favor of using the Blockchain technology when I go grocery shopping.	0.907***	45.539
	I2: If I had access to the Blockchain technology, I would use it.	0.937***	74.300
	I3: I will use the Blockchain technology in the future.	0.824***	18.012

Source: our elaboration

Note: *** p-value < 0.001

4.3 Empirical model and measure validity

To validate the internal and external validity of the measures used for the empirical analysis, we performed a confirmatory factor analysis (CFA).

To ascertain the internal reliability of constructs both values of Composite Reliability (CR) and Cronbach’s alpha are required to be higher than the 0.7 threshold (Hair et al., 2016). As confirmed by data presented in Table 3, all constructs are internally reliable. This is confirmed by the values of standardized factor loadings (see table 2) that are higher than 0.6 and statistically significant. The convergent validity was assessed by the values of the Average Variance Extracted (AVE) that are greater than 0.5 (Hair et al., 2016).

Tab. 3: Constructs reliability and validity

	<i>Cronbach's alpha</i>	<i>Composite reliability (CR)</i>	<i>Average variance extracted (AVE)</i>
Attitude toward the block-chain	0.942	0.963	0.896
Intention to use block-chain	0.869	0.920	0.793
Perceived Ease of Use	0.855	0.903	0.702
Perceived Usefulness	0.877	0.910	0.670
Blockchain Guarantee	0.840	0.893	0.677
Technology Principles Knowledge	0.822	0.895	0.740

Source: our elaboration

Applying the Fornell and Larcker criteria (results proposed in table 4) we confirmed the discriminant validity of the measurement model. Correlations among constructs pair are lower than the square root of AVE, confirming the discriminant validity.

The discriminant validity of constructs included in the measurement model was also confirmed by the heterotrait-monotrait ratio (HTMT) being all values lower than 0.9 (Henseler et al., 2015).

Tab. 4: Discriminant Validity: Fornell-Larcker criterion and Heterotrait-Monotrait ratio

	Age	A	Gender	I	PE	PU	BD	TPK
Age	1.000	0.069	0.024	0.093	0.125	0.096	0.095	0.064
A	-0.068	0.947	0.051	0.685	0.731	0.787	0.768	0.374
Gender	0.024	0.050	1.000	0.065	0.068	0.128	0.120	0.071
I	-0.090	0.627	0.060	0.891	0.685	0.730	0.723	0.383
PE	-0.115	0.657	0.018	0.602	0.838	0.707	0.668	0.409
PU	-0.049	0.730	0.024	0.650	0.624	0.819	0.888	0.540
BG	-0.088	0.685	0.001	0.624	0.572	0.774	0.823	0.521
TPK	-0.029	0.332	-0.048	0.325	0.342	0.473	0.441	0.860

Source: our elaboration

Note: Values along the main diagonal (bold) are the square root of the AVEs. Off diagonal values are the correlations between constructs, and HTMT ratios are above the diagonal.

Finally, values of the variance inflation factor (VIF) for latent constructs lower than 3 indicate the measurement model does not present potential collinearity issues (Hair and Sarstedt, 2021). Values are reported in Table 5.

Tab. 5: Collinearity statistics for the inner model (VIF)

	<i>Age</i>	<i>A</i>	<i>Gender</i>	<i>I</i>	<i>PE</i>	<i>PU</i>	<i>BD</i>	<i>TPK</i>
Age				1.005				
A				1.007				
Gender				1.003				
I								
PE		1.693				1.132		
PU		2.842						
BG		2.577						
TPK					1.000	1.132	1.000	

Source: our elaboration

Note: Variance inflation factor (VIF)

5. Empirical model results

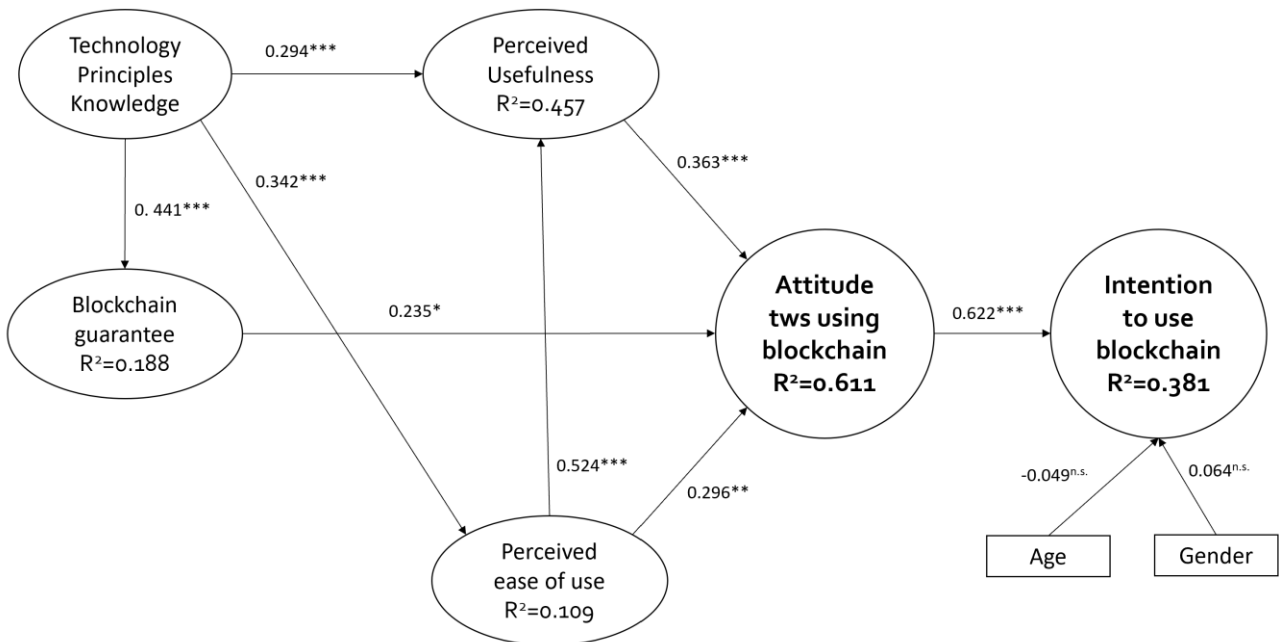
Due to the small sample size, the Partial Least Square Structural Equation Model technique (PLS-SEM) was implemented, as it is considered more reliable with reduced sample sizes and complex models (Hair et al., 2018). A bootstrap routine with 5,000 iterations was implemented to provide standard errors and t-statistics of the relationship among constructs and achieve stability in results (Henseler et al., 2009). The software SmartPLS 4.0 was used to develop the structural model and assess paths among constructs (Ringle et al., 2022). The results are presented in Figure 2. The calculated model presents a good predictive ability being the amount of variance explained by dependent variables modest for the perceived ease of use ($R^2=0.109$) and the blockchain Guarantee ($R^2=0.188$), moderate for the intention to use blockchain during food shopping ($R^2=0.381$) and perceived usefulness ($R^2=0.457$) and strong for the attitude toward the blockchain ($R^2=0.611$).

5.1 Structural model results

Results of the structural equation model confirm all the postulated hypotheses. The perceived usefulness and the perceived ease of use directly influence the attitude toward the use of blockchain ($\beta_{PU \rightarrow A}=0.363$, t-value=2.976; $\beta_{PE \rightarrow A}=0.296$, t-value=2.912), assessing the first two hypotheses. Further, perceived ease of use shows a direct and positive effect on perceived usefulness, in line with H3 ($\beta_{PE \rightarrow PU}=0.524$, t-value=7.759). The technology principles knowledge exerts a positive impact on perceived usefulness ($\beta_{TPK \rightarrow PU}=0.294$, t-value=3.779), perceived ease of use ($\beta_{TPK \rightarrow PE}=0.342$, t-value=3.511), and blockchain guarantee ($\beta_{TPK \rightarrow BD}=0.441$, t-value=6.543). Hypotheses 4, 5, and 6 are confirmed. Direct and positive is also the impact of blockchain guarantee on the attitude toward using the blockchain, as postulated in H6 that is confirmed ($\beta_{BD \rightarrow A}=0.235$, t-value=2.176). Finally, we confirm also H8 as the attitude toward the blockchain positively influence the intention to use the blockchain during food shopping ($\beta_{A \rightarrow I}=0.622$, t-value=7.263).

Although the sample discussion showed that young males were more knowledgeable about the blockchain phenomenon, none of the control variables present a significant impact on the intention to use the blockchain for shopping ($\beta_{Age \rightarrow I}=-0.049$, t-value=0.702; $\beta_{Gender \rightarrow I}=0.064$, t-value=0.404).

Fig. 2: Structural model results



Source: our elaboration

Note: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05; n.s. = not significant effect.

5.2 Indirect effects

Table 6 presents the results of the analysis estimating indirect effects. The perceived usefulness shows a strong and significant indirect impact on the intention to use the blockchain during shopping. The perceived ease of use exerts both a direct and indirect impact on the attitude toward the blockchain by the means of perceived usefulness. Further, the construct evidences a positive and indirect impact on the intention to use the blockchain, mediated by the attitude.

The technology principles knowledge by acting on the perceived ease of use indirectly influence both perceived usefulness and attitude toward the blockchain. The indirect relationship between technology principles knowledge and attitude is also mediated by blockchain guarantee.

Tab. 6: Indirect effects

<i>Indirect effects</i>	<i>Standardized factor loading</i>	<i>T-statistics</i>	<i>P values</i>
PU → A → I	0.226***	3.205	0.001
PE → PU → A	0.190**	2.686	0.007
PE → A → I	0.184*	2.431	0.015
TPK → PE → PU	0.179**	2.814	0.005
TPK → PE → A	0.101*	2.288	0.022
TPK → BG → A	0.104*	2.010	0.044

Source: our elaboration

Note: *** p-value < 0.001; ** p-value < 0.01; * p-value < 0.05.

6. Discussion and implications

The study proposes an innovative perspective on the emerging blockchain phenomenon. The blockchain, a wide database maintaining and continuously updating data about search, orders, behaviours, and any potential record available about a subject, is a technology of undoubted potential in consumer marketing (Jain et al., 2021). The BCT can be very useful for consumers as a tool able to provide information about the product origin (Kumar et al., 2022), tracing the product's path along the agri-food supply chain and giving assurance and guarantee especially when consumers shop for food products, traditionally considered as experience or credence goods (Caswell and Mojdzuska, 1996). Within this context, the results of the present study contribute to the literature by presenting the perspective of consumers in adopting the blockchain in their shopping process. Our findings support the view of blockchain technology as “*an evolutionary breakthrough that empowers a consumer-centric mentality*” (Rabby et al, 2022, p. 266).

A first result emerging from the data collection highlights that the blockchain technology is known only by the 30% of the population. Thus, although increasingly diffused in practice, several consumers do not know about its existence and the potential usage of it. Conversely, those who know the blockchain technology, consider it as a useful and ease of use tool to facilitate their shopping process for food. From a theoretical perspective, results confirm that, among knowledgeable consumers, the blockchain acceptance and practical usage is well anchored in the technology acceptance model (Davis, 1985). In line with previous results within the technology acceptance and usage literature, the direct and indirect positive relationships between perceived usefulness, perceived ease of use, attitude and usage intentions are confirmed by our survey.

Further, results corroborate previous findings of Knauer and Mann (2019), showing that people's tendency to look for new information about an innovation, before using it - the so-called Technology Principles Knowledge - acts positively on perceived usefulness, perceived ease of use, and on blockchain defense. The latter is a novel variable; the authors included it in the Technology Acceptance Model, to test the consumers' opinion about the ability of the blockchain to serve as a guarantee of consumers in food traceability. Results show that when the blockchain technology is perceived as a guarantee for the consumer, ensuring the integrity of food information, it leads to a wider intention to use the blockchain for food shopping. Finally, the strong positive relationship

between attitude and intention confirms consumer interest for blockchain, as resulted in the recent study of Kumar et al. (2022).

The study's findings show that the blockchain technology may represent a useful informational tool for food customers that, thanks to their wearable devices, may quickly and easily access to food information. Customers show an overall predisposition to use new technologies to access information. Today, in fact, access to a digitized world of information, by scanning the QR codes, has become common and widely accepted by consumers. This allows both retailers and food product manufacturers to have new forms of communication and creation of knowledge to the benefit of their customers. The latter can find guarantee and safeguard in the BCT, satisfying their needs for authenticity and safety. But not only. In fact, the BCT spread and adoption is key to support farmers, manufactures and retailers' policies aimed at lowering the environmental impact of their activities: the BCT can be the essential technological infrastructure to ensure the integrity of the information provided.

To support and spread the use of the technology, manufacturers and especially retailers should provide information to consumers on the principles of functioning of the technology and develop dedicated communication messages aimed at enhancing the role of guarantee developed by BCT. To this aim, virtual and physical shops can be very effective platforms to spread technical information on the technology in an easy and straightforward way, studying, for instance, integrating displays, bands, and tapes able to support the trial, and interacting with mobile phones. As a consequence, the findings of the study provide practical suggestions for retailers implementing the blockchain technology in their web and mobile selling interfaces, as well as for policymakers increasingly called to protect people from an unconscious and dangerous use of blockchain.

Similarly, governments are called to afford the blockchain technology spread to guarantee citizens from an untrustworthy diffusion of personal data. As results show, two over three respondents do not know about the blockchain. Indeed, the direct access via personal devices could lead to an unconscious risk of sharing files and personal information. Thus, data sharing and blockchain guarantee, become high-interest topics for institutions aimed at protecting their citizens.

7. Limitations and further research

Although the manuscript offers a first empirical study on consumers' acceptance and adoption of the blockchain technology in their shopping intentions for food, future studies are required to extend these explorative results. First, due to the lack of literature exploring the consumers' blockchain adoption, we cannot corroborate the study's findings with previous results available in the literature. For this reason, one limitation of the present study concerns the generalizability of results.

Further, the sample is composed of respondents of a single country - Italy - while further studies should validate results in countries with a higher technology adoption rate, as well as in countries with a lower technology adoption rate. Moreover, extant literature analyses the differences present in UE and Asian traceability systems and rules (Quian et al., 2020), evidencing the importance of cross-cultural studies. Moreover, due to the novelty of the phenomenon among consumers, the sample is small as the study focused only on knowledgeable consumers. Future studies should investigate potential barriers and the perspectives of those who do not know the technology.

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Business model innovation and ambidexterity in Industry 4.0

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Abstract

Framing and purpose. *The Fourth Industrial Revolution (I4.0) is dramatically affecting firms' strategies, disrupting their business models. In particular, a bunch of technologies like IoT (Internet of Things), cloud platforms, big data, and data analysis are offering firms the possibility to manage products functions, remotely and globally, kick-starting the design of innovative business models. The aim of this paper is to investigate how business model innovation occurs in BtoB manufacturing firms that are exploring the I4.0 scenario.*

Methodology. *The paper fulfils its purposes by the means of a qualitative investigation, discussing empirical evidence coming from a cross-case analysis of 25 Italian SMEs and medium-large enterprises, selected crossing secondary data and indications coming from a specific panel of ten industry experts.*

Results. *The impact of I4.0 technologies on firms' business models depend heavily on the access to user-firms' data. 21 firms are involved in non-disruptive modifications of the business model; 4 firms are conducting more sophisticated experimentations in result-oriented Product-Service Systems. These firms, named "challengers", are in a privileged position in order to unleash the potential of I4.0, introducing advanced services directly related to the customers' needs.*

Implications and originality. *The paper proposes an original framing that contributes theoretically to the literature interfacing business model innovation and ambidexterity management. Moreover, the main empirical finding of the study is that all the challengers adopt a particular form of contextual ambidexterity in which the exploration activities involve specifically selected (key) customers.*

Keywords: *business model innovation, Ambidexterity, I4.0, BtoB manufacturing firms, Italy.*

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1. Introduction

The Fourth Industrial Revolution (Industry 4.0, I4.0) is dramatically affecting firms' behaviors and strategies, transforming products design, manufacture, operations and services (Rüßmann *et al.*, 2015). This disruption is in particular linked to a series of technologies within the I4.0 framework that will dramatically change the way firms operate in their markets (Meindl *et al.*, 2021). Among I4.0 technologies, a set of outward-oriented, front-end set of technological streams - IoT (Internet of Things), cloud platforms, big data, and data analysis - are transforming business markets landscapes, offering firms the possibility to monitor, optimize and automatize product's functions, remotely and globally (Favoretto *et al.*, 2022; Paiola and Gebauer, 2020). These technologies are at the core of a radical transformation of manufacturing, changing firms business models with the expansion of service innovation opportunities (Lusch and Nambisan, 2015).

The interplay of sensors and the development of the internet is central to I4.0: the Internet of Things (IoT) enable data gathering from smart and connected devices, providing firms with strategic information input (Laudien and Daxböck, 2016; Santos *et al.*, 2017). IoT is therefore playing a critical role within I4.0 technologies (Arnold *et al.*, 2016; Roblek *et al.*, 2016). In particular, in this paper we refer to the IoT applied in industry, or the Industrial IoT (IIoT), where software-embedded intelligence is integrated in industrial devices, products and systems (Lee *et al.*, 2014; Paschou *et al.*, 2020; Rymaszewska *et al.*, 2017).

By enabling communications with and among things, IoT has opened the possibility to gather fine-grained real-time data coming from relatively inexpensive sensors and actuators embedded in objects and devices from all over the world (Atzori *et al.*, 2010). This potentially enormous flow of data (big data) poses unprecedented challenges in collection, storage, processing and analysis (Santos *et al.*, 2017). This challenge involves also industrial services (Gebauer *et al.*, 2020), since data can be leveraged in order to enhance products and design innovative product-service systems (Belvedere *et al.*, 2013), optimize customer segmentation, positioning and pricing strategies and modify business models' component configurations over time (Santos *et al.*, 2017).

Overall, new and disruptive business models are emerging in the I4.0 landscape, posing big challenges to entire industries (Bain, 2022; Stock and Seliger, 2016). The aim of this paper is to investigate this phenomenon from the point of view of BtoB manufacturing firms, whose traditional strategies are being disrupted by the ongoing revolution (Paiola and Gebauer *et al.*, 2020; Laudien and Daxböck, 2016; Müller *et al.*, 2018). The empirical section involves 25 Italian BtoB manufacturing firms, whose strategic shifts related to I4.0 technologies are described and analyzed in relation to business model innovation.

The paper proposes an original framing that contributes to the literature interfacing business model innovation and ambidexterity management: capitalizing on previous studies and on the empirical evidence, the paper investigates a so far overlooked topic, related to the circumstance in which incumbent firms in given industries disruptively innovate their own current business models. Moreover, findings allow us to explore the circumstances under which contextual ambidexterity may represent a superior strategy and a viable perspective for firms facing disruptive technological change as is the case in the I4.0 scenario.

2. Theoretical background

2.1. The impact of I4.0 on business models: new services and revenue models

Despite the noteworthy role of technology in I4.0, scholars maintain that it is only part of the picture (Arnold *et al.*, 2016). In fact, firms have to work hard on their business models in order to exploit technological opportunities and avoid disruption, since "a mediocre technology pursued within a great business model may be more valuable than a great technology exploited via a mediocre business model" (Chesbrough, 2010, p. 355).

Even if a thorough review of business model literature is far beyond the aim of this paper, some further considerations regarding the concept of business model may be useful in order to properly introduce the importance of business model innovation and to better understand the scope of the ongoing transformation. Essentially, a business model summarizes the architecture and logic of a business (Baden-Fuller and Morgan, 2010): either explicitly or implicitly, whenever a firm is established, it employs a particular model that describes “the design or architecture of the value creation, delivery, and capture mechanisms it employs” (Teece, 2010, p. 172), that is fundamental functions in the strategic life of a firm (Chesbrough and Rosenbloom, 2002).

Therefore, business model innovation is a process through which firms realize changes in the activities and functions within their business models and explore new architectural designs: it consists in exploring new possibilities related to value proposition definition, value creation, distribution and capture for customers, suppliers and partners (Casadesus-Masanell and Zhu, 2013; Gambardella and McGahan, 2010).

Given this, an important aspect that literature has dealt with - that is connected to the definition itself of business model innovation - is related to the magnitude of the change, or the circumstances under which we can define that a modification in the business model is an innovation (Loebbecke and Picot, 2015). In fact, modifications in the business models can pose serious challenges to firms, impacting heavily on their efficiency, complementarities, lock-in, novelty and the linkages among them (Amit and Zott, 2001). At this regard, literature on business model innovation presents two conflicting approaches (Demil and Lecocq, 2010): “business model innovation” versus “business model development” (Schneider and Spieth, 2013), or incremental versus radical (disruptive) perspectives (Wahyomo, 2018).

The circumstance is particularly important here, since it refers directly to the question whether I4.0 calls for an adjustment or a radical change in the business model. At this regard, literature has highlighted some of the main consequences of I4.0 technologies on firms’ strategies (Ritter and Pedersen, 2020): for instance, Laudien and Daxböck (2016) describe how a “full utilization of IIoT” requires a radical innovation of the firms’ business model. Innovative firms are now encouraged to leverage on services in order to create entirely new business models, finally migrating from product-centric approaches to service-oriented ones (Coreynen *et al.*, 2017). In fact, counting on hundreds or thousands smart and connected devices installed at the premises of final-user firms is something that can change the rules of the competition, making space for brand new data-based service-oriented business models (Opazo-basaez *et al.*, 2021; Raddats *et al.*, 2022).

Consequently, I4.0 technologies affect the design and development of the offering, in the direction of a dramatic expansion of service innovation opportunities, increasing the relevance of the transition of manufacturing firms toward service-based strategies (Tilson *et al.*, 2010). The connection between I4.0 technologies and service development is so firm that, recently, a growing research stream has begun to study technology as an enabler for servitization, triggering “digital servitization” as a specific research stream (Paschou *et al.*, 2020; Kowalkowsky Bigdeli Baines, 2022).

Thus, thanks to technologies, manufacturing firms can unlock the supply of Product-Service Systems (PSSs) (Pirola *et al.*, 2020): firms’ value propositions shift gradually away from pure products toward pure services, in the form of use-oriented and result-oriented offerings, gradually changing the focus towards advanced forms of market relations in which a solution is being purchased and paid for. While a product-oriented PSS is perfectly fit for the manufacturing firm’s classical repertoire, use-oriented and result-oriented ones are more distant from traditional business models adopted and call for major redefinitions of the firms’ business models ((Adrodegari *et al.* 2018).

In fact, I4.0 is both able to “boost” traditional industrial services (like maintenance), and to be the starting point of a potential disruption of traditional BtoB business models. In particular, IOT-based use-oriented and result-oriented PSS imply a radical shift in the fundamental revenue models of the firms, introducing usage-based, performance-based and value-based revenue models (Adrodegari and Saccani, 2017; Bonnemeier *et al.*, 2010). Capital equipment manufacturers that are

used to achieve profitability from conventional services such as spare parts are therefore beginning to change their value propositions toward PSSs (Hypko *et al.*, 2010), PSSS (Kohtamaki et al JBBR 2021), and to look to those new revenue models (Rymaszewskaa *et al.*, 2017). This is changing the mechanisms of revenue generation (along with costing structures, risk assessment and reciprocal liabilities among partners) from a transactional perspective to a relationship-based one (Gaiardelli *et al.*, 2014).

If we consider that “the more challenging the revenue architecture, the greater the changes likely to be required to traditional business models” (Teece, 2010, p. 186), we can assume that those changes will not be trivial. A particularly problematic scenario is present whether a relevant change in the business model core elements is expected, and when furthermore the changes might lead the existing business models to become obsolete and uncompetitive, putting organizational structures and culture at stake (Bock *et al.*, 2012). Those challenging problems will be the object of the following section, that deals in particular with business model innovation crucial questions that are relevant for our research.

2.2. Business model innovation and ambidexterity: a critical review

The literature on business model innovation has shed light on important issues (Spieth, Schneckenber *et al.*, 2014; Wahyono, 2018). But when it comes to considering the crucial question of how an incumbent firm in a given sector disruptively innovates its own business model, we realize there is still a sizable area to explore (Paiola *et al.*, 2022). The perspective of ambidexterity, in the sense of exploration-exploitation *à la* March (1991), clearly seems to be the most appropriate for framing cases of business model innovation of disruptive type because developing a radically new business model demands an exploratory process that is particularly onerous from the point of view of the resources required. But the link between ambidexterity and business model innovation has only recently begun to attract scholarly attention (Khanagha *et al.*, 2014; Markides, 2013; Ricciardi *et al.*, 2016; Sosna *et al.*, 2010).

In this interfacing literature, the contribution from Markides (2013) serves as a useful starting point in order to arrive at our research question, which is the previous one specified in the emerging scenario of the I4.0. He claims that the simultaneous management of dualities such as exploration and exploitation, efficiency and flexibility, or low cost and differentiation, has been framed as an ambidexterity issue. From this starting point, the problem the author wishes to analyze is how a firm can compete with two conflicting business models simultaneously, that is one additional type of duality a firm may face. More precisely, in certain circumstances firms must develop a new and disruptive business model, that it is conflicting with the extant one. For this ambidexterity challenge, Markides identifies three possible solutions:

1. spatial separation;
2. temporal separation; or
3. contextual ambidexterity.

In the first, two business models are physically separated into two distinct organizations, or organizational units within the same organization (O’Reilly and Tushman, 2004). Instead, the temporal separation strategy means that a firm starts out by putting the new (and conflicting) business model “in a separate unit but reintegrate it in the main business over time (i.e., phased integration strategy)” (Markides, 2013, p. 315). The discriminatory variable between spatial separation and phased integration is the (perceived) strategic relatedness between the market for the established business model and the market for the new one. If this relatedness is weak, then firms will opt for separation; if it is strong, they will choose phased integration, or a simpler and manageable transition to duality (Visnijn *et al.*, 2021). In the latter case, a firm aims to exploit synergies between the new market and the existing business, but prefers to “separate for a period of time and then slowly merge the two concepts so as to minimize the disruption from the conflicts” (Markides, 2013, p. 25).

While using the former two solutions the conflict between two business models are solved by managing them separately (in the early stages, at least), the third solution (contextual ambidexterity) involves managing the business models simultaneously. Following Gibson and Birkinshaw (2004, p. 210), this kind of ambidexterity is achieved “by building a set of processes or systems that enable and encourage individuals to make their own judgments about how to divide their time between conflicting demands for alignment and adaptability”, i.e. between exploitation and exploration. In this case, every individual working in a given organizational context is ambidextrous (Birkinshaw and Gibson, 2004). However, in Markides (2013) and other authors (Hu and Chen, 2016; Lavie *et al.*, 2010; Winterhalter *et al.*, 2016), the meaning of contextual ambidexterity is broadened, providing a multifaceted construct that indicates more than one way to handle two business models within the same organizational context. Accordingly, contextual ambidexterity includes those cases where some employees manage the relationships with demanding clients whose complex needs require a superior exploration investment (Bednarek *et al.*, 2016; Im and Rai, 2008). However, as Markides (2013, p. 317) points out, it is by no means easy to create an organizational context suitable to manage two conflicting business models simultaneously: “On one hand, it [the firm] has to create enough distance between the two business models that they don’t suffocate each other; on the other, it has to keep them close enough to exploit synergies between the two”.

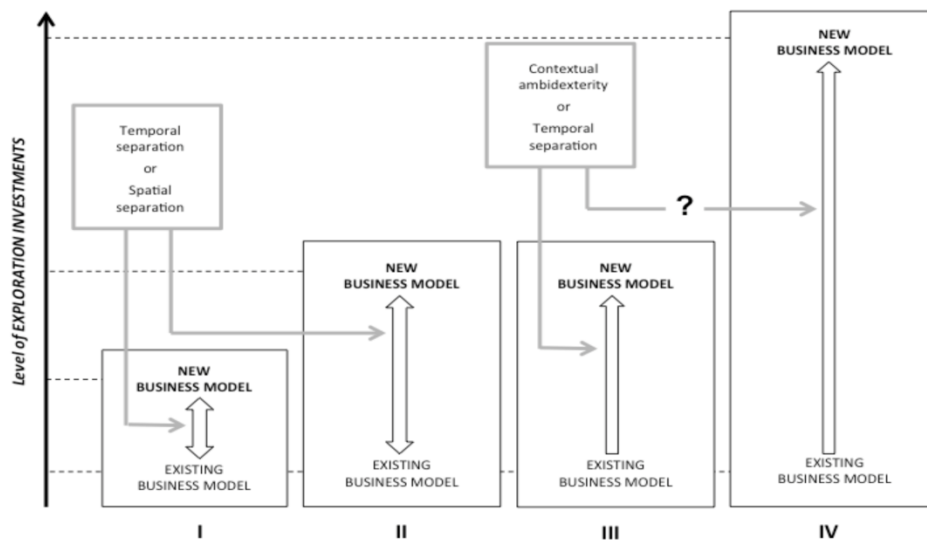
The ambidexterity considered in Markides’s typology concerns the duality between conflicting business models. But it can also be interpreted in the sense of an ambidexterity revolving around the classic dichotomy of March’s exploration-exploitation (1991), bearing in mind that research on ambidexterity seems to have converged mainly on this type of duality (Birkinshaw and Gupta, 2013; Junni *et al.*, 2013; Stadler *et al.*, 2014). However, we simply need to acknowledge, according to some authors (Bröring and Herzog, 2008; Gerdoçi *et al.*, 2018; Sun and Lo, 2014), that exploration and exploitation may hardly be completely separated. Therefore, in the cases of a dual business model considered by Markides, the new business model is distinctive for its strong focus on the exploratory activity, whereas exploitation amply prevails in the extant business model. In the case of contextual ambidexterity, the old and new business models - which differ considerably in their balance of exploration and exploitation, and (partly for this reason) are also in conflict with one another to some degree - must coexist and interact in the context of the same organizational structure, posing contrasting demands to management (Andriopoulos and Lewis, 2009). On the other hand, spatial separation or temporal separation of the two business models are variants of structural ambidexterity, in the sense of the ambidexterity that can be achieved by creating dual structures (Altuna *et al.*, 2015; Bröring and Herzog, 2008; Gibson and Birkinshaw, 2004; Raisch and Birkinshaw, 2008).

Having clarified this point, the contribution from Markides (2013) serves as an important reference when dealing with the topic of disruptive business model innovations. His concept of business model duality can be further refined by explicitly considering the presence of a strategic innovator in the market. In the paper that inspired the first two solutions envisioned in Markides (2013), Markides and Charitou (2004) wrote that the problem of how a firm can adopt two different business models in the same market “has become particularly pressing for an increasing number of established companies that have recently come under attack from ‘strategic innovators’ - companies that attack the established players by using radically different business models” (p. 22). But unfortunately, this is not the problem that Nestlé (one of the examples mentioned by the authors) faced when introducing Nespresso to the market. In this case (as in others), Nestlé was the strategic innovator.

Therefore, distinguishing the situations in which there is a strategic innovator serving as a reference for the focal firm from those where the latter develops its own disruptive business model, is of uttermost importance for our discourse. To do that, we can think in terms of the investments in exploration, i.e. of the investments in knowledge needed to embark on the exploratory activity. The level of such investments correlates with the degree of uncertainty inherent in the exploratory process, and it is lower if there is a strategic innovator, and higher without it. In the former case, there is indeed a sort of “template” - to borrow a concept used in studies on the replication of

organizational routines (Winter and Szulanski, 2001) - that the follower can use to speed up the process of exploration learning, and reduce the related costs and uncertainties. For instance, it may recruit some of the strategic innovator's key employees, who have experience of the new business model (Wezel *et al.*, 2006). Figure 1 shows the differences in the two above-described types of disruptive business model innovation (I and II), together with the spatial and temporal separation strategies that may be feasible in both situations, but under different circumstances.

Fig. 1: Disruptive business-model innovations: a typology (Authors' elaboration)



The double arrow connecting the existing business model with the new one in Figure 1 indicates that the two business models are destined to coexist within the scope of the firm, even if they demand a temporary or permanent separation on the organizational level. This prerogative is shared by all the cases of structural ambidexterity contemplated in Markides (2013)'s framework: online trading systems; internet banking and internet brokerage; budget, no-frills flying; and others (Markides and Charitou, 2004). We frequently find such cases in the literature on business model innovation, which has flourished in the last 15 years largely thanks to advances in ICT, and to the fact that many e-businesses are based on new business models (Amit and Zott, 2012; Casadesus-Masanell and Ricart, 2010; Shafer *et al.*, 2005). The adoption of a cloud business model by Telco, studied by Khanagha *et al.* (2014), also belongs to this typology, as an example of temporal separation. More in general, spatial or temporal separations are typical of strategies to develop a new market segment, as illustrated by the case of Nestlé. Consequently, the main source of conflict between the two business models derives from a cannibalization between the corresponding market segments (Markides and Charitou, 2004; Velu and Stiles, 2013).

But what happens when an existing business model has to be switched to a new one (type III in Figure 1)? There are numerous anecdotal accounts of such a situation, but - to the best of our knowledge - only Sosna *et al.* (2010) have proposed an interpretation through the dual lens of business model innovation and exploration-exploitation ambidexterity. Their in-depth study concerned a Spanish dietary products company that was converted from a foodstuffs wholesaler into a franchisor managing the international retailing network Naturhouse. The strategy adopted by the firm to complete its business model "metamorphosis" (as the authors named it) involved what Markides (2013) called a temporal separation. However, the final solution didn't entail an integration of the two business models - which remained distinct (as in type II) - but a dissolution of the old model, which was replaced by the new one (type III). Actually, even contextual ambidexterity is a theoretical option in case of type III, whereas spatial separation - by definition - makes no sense in such cases.

At this point, we can set the stage for our study, which certainly differs from the above-mentioned one (type III) in that the exploratory process entails a higher level of investments in knowledge. This is because I4.0 is an even more broadly open scenario, rich in opportunities, but also burdened with uncertainties. In particular, exploring opportunities in I4.0 demands the ability to master different knowledge domains and be able to combine them together. Facing such a level of exploration breadth¹ clearly means raising exploration investments (type IV in Figure 1). But then, in the current phase at least, firms that advance on the I4.0 frontier should all be seen as pioneers, i.e., they cannot draw on successful prior experiences of strategic innovators that they might observe and imitate (as in III). Moreover, their goal may be not to juxtapose two business models, but to transition from one to another (as in III). Finally, the choice of which strategy to adopt - temporal separation *versus* contextual ambidexterity - clearly remains an open question, that our study attempts to answer. At the same time, bearing in mind the abovementioned broad definition of contextual ambidexterity, we also look into the solution adopted by each firm to manage its metamorphosis.

3. The empirical research

3.1 Methodology and overall description of the empirical cases

As I4.0 is still an emerging and puzzling phenomenon, we designed an explorative qualitative investigation, implementing a cross-analysis of different companies, coherently with well-known specific literature on qualitative research and collective case-study (Eisenhardt, 1989; Yin, 1994; Stake, 1995).

Consistently, instead of aiming at building a statistically representative sample we preferred to focus on diversity, designing a setting able to describe the different situations and challenges facing firms in the I4.0 scenario described above (Miles & Huberman, 1994). In a preliminary investigation phase, through the use of a semi-structured interview template, we interviewed 10 industry experts selected on the base of their specialization in the field and their expertise using secondary data, personal and professional contacts.

Their indications and suggestions have been critical in the subsequent phase of selecting the sampled firms. We constructed a preliminary list of firms as coming from the experts' suggestions and started to contact top managers belonging to the different companies, targeting both top managers (CEOs, and GMs) and specific function managers presumably directly involved in the transformation elicited by I4.0 (like CTOs, CIOs, etc.). Once the contact was established, a first personal phone call by the researchers was managed in order to explain the nature and aims of the research, to assess the firm's willingness to participate in the investigation and identify which managers/professionals was specifically to be involved in the interviews. Between the beginning of 2017 and mid-2018, we collected data coming from several in-depth face-to-face semi-structured interviews with firms' key-informants and top managers in charge of technological or specifically IoT-related activities, like Chief Executive Officers, General Managers, Business Developers, Chief Marketing Managers, Chief Technology Officers, Chief Information Officers, and Chief Human Resources Officers.

¹ The concept of exploration breadth draws on that of knowledge breadth, which refers to the range of fields over which a firm has knowledge (Prabhu, Rajesh, & Mark, 2005).

Tab. 1: Empirical cases, firms' characteristics and interviews outline (Author's elaboration)

Company	Industry	Rev. (mio)	Emp.	Value system*	Sales model°	Product type (prevalent)	Digital technologies^	Interviews, roles, total duration§
1	Professional equipment	3	8	OEM	Indirect	Standard	IOT	1, SM, 2h
2	Machine tools	8	26	OEM	Direct	Custom	IOT	2, CEO, 2,5h
3	Professional equipment	6	30	OEM	Indirect	Standard	IOT, Cloud	2, CEO, CTO 3h
4	Mechanical components	8	34	OES	Indirect	Standard	IOT, Cloud, DA	2, CEO, 2,5h
5	Packaging machines	20	84	OEM	Direct	Custom	IOT	2, CEO, CMM, 2h
6	Packaging machines	50	120	OEM	Direct	Custom	IOT, Cloud, DA	2, BD, 3,5h
7	Inspection machines	37	143	OEM	Direct	Custom	IOT	1, CTO, COO, 2h
8	Professional equipment	105	150	OEM	Indirect	Standard	IOT, cloud	2, CEO, 2,5h
9	Heating control systems	48	195	OES	Indirect	Standard	IOT, Cloud	3, CTO, CMO, 4h
10	Heating devices	61	233	OEM	Indirect	Standard	IOT, Cloud, DA	3, CEO, 4h
11	Food machines	150	250	OEM	Indirect	Standard	IOT, Cloud, DA	3, SM, CTO, 5h
12	Home automation	130	410	OEM	Indirect	Standard	IOT, Cloud	2, CTO, 2h
13	Diagnosis machinery	90	458	OEM	Indirect	Custom (modular)	IOT, Cloud, DA	1, CMM, CTO, 2h
14	Heating control systems	166	602	OES	Indirect	Standard	IOT, Cloud	4, CTO, CIO, 5h
15	Machine tools and plants	202	652	OEM	Direct	Custom	IOT, Cloud, DA	3, CTO, CHRO, 5h
16	Retail equipment	240	697	OEM	Direct	Standard (modular)	IOT, DA	2, CTO, 3h
17	Off-road automation	157	743	OES	Indirect	Standard	IOT, Cloud	4, CEO, CTO, 4h
18	Water management devices	278	761	OEM	Indirect	Standard	IOT, Cloud	1, SM, CTO, 5h
19	Heating components	276	801	OES	Indirect	Standard	IOT, Cloud	3, CEO, CTO, 3h
20	Heating equipment	235	820	OES	Indirect	Custom (modular)	IOT, Cloud	3, CEO, SM, CTO, 4,5h
21	Coffee and coffee machines	381	842	OEM	Direct	Standard	IOT, Cloud, DA	2, CTO, 4h
22	Retail equipment	225	975	OEM	Direct	Standard (modular)	IOT, Cloud, DA	1, CMM, 2h
23	Packaging machines	219	1005	OEM	Direct	Custom	IOT, Cloud, DA	3, GM, 5h
24	Home automation	211	1058	OEM	Indirect	Standard	IOT, Cloud	4, CMM, 4h
25	Packaging machines	239	1263	OEM	Direct	Custom	IOT	1, CTO, 1,5h

*OES: Original Equipment Suppliers; OEM: Original Equipment Manufacturer.

°Direct: prevalent direct relations with customers; Indirect: prevalent use of external distribution channels.

^IOT = Industrial internet; Cloud = Cloud systems; DA = Data Analysis

§ BD: Business Developer; CEO: Chief Executive Officer; CHRO: Chief Human Resources Officer; CIO: Chief Information Officer; CMO: Chief Marketing Officer; COO: Chief Operations Officer; CTO: Chief Technology Officer; GM: General Manager; SM: Service Manager.

In many cases, 2 or more people have been involved in the interviews, for a total duration of approximately 77 hours. The aim of the field research was to get detailed information on the type of technologies used by the firms, the current and potential use of those technologies and the resulting changes in the business model. Table 1 portrays an outline of the sample: the total number of interview sessions, roles of the interviewees, total duration of the interviews.

Interviews were registered, transcribed and coded in order to be able to better understand differences and similarities among companies. Follow-up meetings and calls have been arranged in order to deal with any unclear topic and avoid any misinterpretation. Main results of the investigation have been shared with interviewees in the form of an accurate presentation of the findings in order to have a first and direct feedback regarding the accuracy of the data.

As Table 1 shows, the empirical investigation has involved 25 Italian firms in various degrees involved in digital transformation processes. All the firms are located in the North of Italy (in particular: Emilia Romagna, Friuli, Lombardy, Veneto), a geographical location that - in terms of manufacturing production - has a long and acknowledged tradition and a world-class standing, being the most advanced industrial regional system in the country and one of the most relevant in UE (De Marchi and Grandinetti, 2017).

The sampled firms cover a large array of industrial specializations that are heavily involved in technological evolutions related to I4.0, like the production and manufacturing of machine tools and plants, mechanical components, packaging machines, food processing machines, inspection and diagnosis machines, water management devices, professional cooking equipment, retail equipment,

heating control systems and devices, off-road automation devices, home automation. Therefore, the empirical sample was set to provide sketches of strategies, problems and challenges of different firms in different contexts, in order to facilitate the emersion of a differentiated portfolio of technology utilization and business model innovations.

In fact, selected firms have different value chain positions (19 OEMs and 6 OESs) and sales models (9 firms sell prevalently directly to their final-user firms, while 16 have a mainly indirect access to the customers). One firm is below 20 employees and qualifies as very small, whether a core group of 11 enterprises are SMEs, employing a range of 20-500 people (De Clercq *et al.*, 2014; Lubatkin *et al.*, 2006). A final group of 13 firms are medium- to large-enterprises, with a total number of employees above 500. In line with Laudien and Daxböck (2016), no large multinational corporation has been included in the investigation, and only two firms in the sample have more than 1.000 employees.

Firms' competitive strategies are frequently characterized by segment or niche focalization, with a consequent specialization of resources, capabilities, products and services: 10 firms prevalently customize their products and solutions on customer's needs, while standard products are mainly produced in low to medium batch sizes. Very often, firms are leaders in the respective niche / industry, testifying for a tradition of good managerial capabilities and successful strategic alignment with the environment. Nonetheless, they are looking at the present technological transformation with great attention and caution, with the consciousness that the change could be both an opportunity and a threat.

On the whole, the sampled firms are trying to figure out how to use technology in order to modify their value propositions, conveying new services and nurturing new relations. Every firm has invested in technologies able to make its products smart and connected (i.e. IoT) but not in every case the digitalization is complete: only 8 firms out of 25 have deployed solutions that involve all the technologies we deem critical for I4.0 (IoT, Cloud platforms, Data analysis) and have started to gather and analyse data coming from the installed base (in various degrees and with different time spans).

While every company has a clear idea of what I4.0 technologies can do for basic services that are traditionally offered by BtoB manufacturing firms (such as maintenance and assistance), on the other hand, radical changes have been projected, analyzed and acted in very few cases. The introduction or testing of disruptive value propositions and business models is consequently very uncommon. In particular, as we will see in the proceeding of the work, the circumstance whether the firm has a direct contact with the final user is critical in shaping its strategy.

3.2 Main findings: value propositions shifts and business model changes

Table 2 represents basic features of business model changes caused by I4.0 in the sampled firms, especially as regards the change of the value proposition toward advanced services. All the firms are exploring the possible uses of I4.0 for sustaining their value propositions, aiming at enhancing services already provided or introduce new ones, as in the cases of maintenance ticketing, warranty management or Remote Condition Monitoring. If, on the one hand, those service-oriented uses of I4.0 may be technically challenging, on the other they remain within the domain of product-oriented PSS enhancements. Therefore, in most cases (21) it is a matter of non-disruptive modifications of the firms' business models that fundamentally are comfortably rooted in the currently prevalent product-orientation culture that permeates all the manufacturing firms of the sample (see: low and low- medium BM conflicts in table 2).

Tab. 2: Business model (BM) changes in the investigated firms (Authors' elaboration)

Company	Industry	Rev. (mio)	Emp	Value system	Sales model	Sales model changes	Value proposition orientation	Value proposition shift (PSS)	BM change scope	BM conflicts	Ambidexterity management
1	Professional equipment	3	8	OEM	Indirect	=	Product		Limited	Low	
2	Machine tools	8	26	OEM	Direct	=	Product		Limited	Low	
3	Professional equipment	6	30	OEM	Indirect	=	Product		Limited	Low	
4	Mechanical components	8	34	OES	Indirect	=	Product		Limited	Low	
5	Packaging machines	20	84	OEM	Direct	=	Product		Limited	Low	
6	Packaging machines	50	120	OEM	Direct	=	Product	To result-oriented	Wide	Medium-high	Contextual
7	Inspection machines	37	143	OEM	Direct	=	Product		Limited	Low	
8	Professional equipment	105	150	OEM	Indirect	To direct	Product		Limited	Low-medium	
9	Heating control systems	48	195	OES	Indirect	=	Product		Limited	Low	
10	Heating devices	61	233	OEM	Indirect	To direct	Product		Limited	Low-medium	
11	Food machines	150	250	OEM	Indirect	=	Product		Limited	Low	
12	Home automation	130	410	OEM	Indirect	=	Product		Limited	Low	
13	Diagnosis machinery	90	458	OEM	Indirect	To direct	Product		Limited	Low	
14	Heating control systems	166	602	OES	Indirect	=	Product		Limited	Low	
15	Machine tools and plants	202	652	OEM	Direct	=	Product		Limited	Low	
16	Retail equipment	240	697	OEM	Direct	=	Product	To result-oriented	Wide	Medium-high	Contextual
17	Off-road automation	157	743	OES	Indirect	To direct	Product		Limited	low-medium	
18	Water management devices	278	761	OEM	Indirect	=	Product		Limited	Low	
19	Heating components	276	801	OES	Indirect	To direct (planned)	Product		Limited	Low-medium	
20	Heating equipment	235	820	OES	Indirect	To direct (planned)	Product		Limited	Low	
21	Coffee and coffee machines	381	842	OEM	Direct	=	Product		Limited	Low	
22	Retail equipment	225	975	OEM	Direct	=	Product	To result-oriented	Wide	Medium-high	Contextual
23	Packaging machines	219	1005	OEM	Direct	=	Product	To result-oriented	Wide	High	Contextual
24	Home automation	211	1058	OEM	Indirect	=	Product		Limited	Low	
25	Packaging machines	239	1263	OEM	Direct	=	Product		Limited	Low	

This situation is related to the fact that I4.0 technologies' impact on new business models depend heavily on the access to user-firms' data. Firms with a direct relation with final-user firms (that is firms with a direct sales model in tables 1 and 2) are very well to offer new services destined to the final-user firms' processes, while in case of an indirect relationship that option is out of reach. That is why firms that belong to the latter case (OEMs with an indirect relation with final user firms or first/second tier OESs) are stuck in a position that only a very difficult downstream move can change: as one can see in table 2, only 6 out of the 16 firms having an indirect access to user firms' data are making (or planning) such a step.

However, 4 firms are aimed at more sophisticated explorations: they are experimenting result-oriented PSS, challenging the established business model with performance-based contracting via IOT-based remote condition monitoring. These "challengers" - all OEMs with a custom or modular product and a direct sales model (see Table 2) - are in a privileged position in order to unleash the potential of I4.0, introducing advanced services directly related to the customers' needs instead of

the mere product-oriented ones. As one can easily understand, those firms are truly facing a disruptive new business model: new forms of contractual agreements that move away from the ownership-based transactional sale of products represent a big challenge since the new offer is directly cannibalizing established sales, dangerously conflicting with the current business strategy. Let's consider, for instance, the revenue model implied in outcome-based contracts: here the billing mechanism is benchmarked on equipment's efficiency (i.e. uptime level) or to the actual rate of utilization of the product, suggesting firms to be very careful in approaching the topic (in particular in industries in which the amount of capital expenditure underlying product manufacturing is significant).

In those cases, as we'll see, the critical capability firms have to master is to manage the conflicts that may arise between traditional and emergent business models. In particular, this is the area in which firms will have to succeed in managing duality and be ambidextrous, matching the exploration of the new and the exploitation of the old: the following sections will describe in depth the specific forms of ambidexterity management adopted by the sampled firms.

3.3 Business model innovation and contextual ambidexterity in Industry 4.0

To make a step further, in this section we'll focus on the challenger firms ("challengers"), adding some further information (see table 3). In order to better understand the context in which challengers act, in the following paragraphs a more detailed description will be provided.

Company A is a Small firm that produces machines and solutions for the packaging of tissue products, with strong capabilities related to innovation and service development. According to UCIMA (Italian Packaging Machinery Manufacturers' Association), the automatic packaging machinery industry is one of the most dynamic Italian industries: it counts around 200-250 industrial companies with a total turnover of more than €7 billion, of which more than 80% comes from export. A employs 120 people, has a turnover of €50mio and is located in the so-called "Packaging Valley" in Emilia Romagna, a region with the highest concentration of packaging companies in the world (along with Lombardy, Piedmont and Veneto).

Company B belongs to the same industry, although to a different niche: located in Lombardy, it is a leader company in producing complete packaging systems and lines, especially for dried food. It is a medium-large enterprise that employs 1005 people in 4 different production locations in the world, with a total turnover of €219mio², with a strong and long-standing reputation in quality, innovation and customer service.

Company C and D are both medium to large firms belonging to the same industry. They are leader companies in the design, manufacture and installation of complete equipment for the retail sector: the production of commercial refrigerated furniture, systems and solutions is indeed an industry in which Italian firms can boost a long-standing tradition and reputation. Company C, located in one of the industrial clusters in the Veneto region, is now a global company that employs 697 people worldwide and totalizes €240mio revenues. C is renowned for its flexibility and its extensive product range, constantly updated in line with the evolution of big retail chains.

Company D is located in Lombardy and employs 975 people, totalizing €225mio revenues. It belongs to a dynamic group of firms focused on the production of furniture for the commercial sector, working with the world's grocery and FMCG leaders, to whom it offers personalized systems and turn-key solutions. As final remark - that as we'll see is connected to the way challengers manage ambidexterity in I4.0 - we have to underline that all the companies operate in highly competitive markets facing international and global customers, that in many cases are MNEs with sophisticated needs and big bargaining power.

² In this case, due to administrative balance sheet consolidation policies within corporate groups, we couldn't report facts and figures related specifically to the packaging system division within the firm's corporate group. For that reason, while the selected product line represents the majority of the business, facts here reported encompass also different divisions and product areas.

As we have seen previously, these firms started to manage the relation with key customers in a completely new way than in the past, linking (partially or totally) the revenues of the equipment supplied to the performance levels reached by their user-firms in their typical operations. In order to face those non-trivial changes, and protecting their extant business model from the potential disruptiveness of the change, challenger firms in our sample are adopting a contingent solution that is different from those envisioned by previous research: they are implementing a sort of “hidden” dual business model, since it is a particular form of exploration of the strategic duality related to digital technologies in which the new business model is acted in protected and bounded contexts. In fact, in order to containing the conflicts, controlling the potential disruptiveness and exploiting synergies among the extant and the new business model, our challengers are encapsulating the exploration space into selected supplier-customer relations, developing the new value proposition and the new business model only for selected customers (key customers).

As we’ll see in detail, this solution entails specific forms of ambidexterity management that pertain to the broadened concept of contextual ambidexterity introduced earlier: to better understand this point, let’s compare similarities and differences of the highlighted cases, in order to better investigate the reasons of this circumstance.

Tab. 3: Ambidexterity management mechanisms in challenger firms (Authors’ elaboration)

Case	Industry	Rev. (mio)	Emp.	Categorial framing of BM innovation			Urgency of the BM change	Markets strategic relatedness	Potential disruptiveness of the new BM	Template of the new BM	Exploration breadth	Mechanisms to exploit synergies	Type of customer	Strategic management of duality
				Threat versus opportunity	Proactive versus reactive	Short term versus long term								
A	Packaging machines	50	120	Opportunity	Proactive	Long	Low	High	High	None	High	Focus on key customers	Large MNE	“Hidden” dual business model
B	Packaging machines	219	1005	Opportunity	Reactive	Long	Low	High	High	None	High	Focus on key customers	Large MNE	“Hidden” dual business model
C	Retail equipment	240	697	Opportunity	Proactive	Long	Low	High	High	None	High	Focus on key customers	Large MNE	“Hidden” dual business model
D	Retail equipment	225	975	Opportunity	Reactive	Long	Low	High	High	None	High	Focus on key customers	Large MNE	“Hidden” dual business model

Table 3 reports challengers’ data regarding the main traits the literature has highlighted in order to understand how to manage dual business models. Notwithstanding the unavoidable differences in industries, market conditions and firms’ resources and capabilities, the cases share some similarities.

Firstly, all the firms are facing extremely high levels of exploration breadth, due to the fact that no template and no previous experience is present in relation to an experimental business model whose potential hostility to the established one is extreme. Moreover, all “pilot” projects involve key customers, being in fact sponsored by very large, sophisticated and culturally advanced firms facing global markets, often leaders in their respective industry. Finally, all the firms share the same categorial framing regarding the role of digital technologies and I4.0 in their strategies: they classify the challenges they face prevalently as opportunities (even if they are completely aware of the risks), and adopt a long-term strategic horizon in order to evaluate actions and returns of the investments.

3.3.1 The inception of the new business model

An interesting difference that seems to emerge regards the inception of the project, or - so to say - the trigger that initiated the path. In fact, in the case of Company B the initial trigger for exploring

a dual business model is an extant customer: a large firm operating in the food and beverage industry, worried of the bad efficiency performances showed by its operations, and looking for suppliers capable to help to solve the problem and possibly to take over the entire process on its behalf.

Company D has started an important project with one of its clients, a key customer that, in this case, is the trigger of the exploration: a large MNE of the food and beverage industry with a huge installed base and with very specific needs related to the use of I4.0 technologies that haven't found a proper solution yet.

Cases A and C, on the contrary, show a more proactive strategic move: company A is conducting explorations in the possible uses of digital technologies since 2016, actively investing for the design of a possible new service solution; gradually the project becomes well-defined and larger, involving also external firms for the provision of the most technological requirements. Then, starting approximately from 2017, the company starts scouting its account portfolio in search of a suitable customer in order to test the system and "go live". As the company A's Business Development Manager says: "*we are trying to invent new services that affect directly the customer's business; in a sense we are creating our future customer*".

Company C is involved in an ongoing pilot experiment oriented to a specific niche of its market identified as possible target of a new value proposition. A large-scale retailer is the key customer involved in the project of envisioning a complete result-oriented solution capable of relieving the customer from any direct responsibility and direct activity on the machines during the use. "*Finding out the right customer and the right way to explain the solution is the most difficult part*", says the company C's CTO, recognizing that its market in general is not so prepared and sensitive, mainly for cultural reasons, even if first signs of dynamism are present.

It is important to underline, however, that the difference between proactive and reactive approaches doesn't have to be neither overlooked nor overrated: in fact, companies B and D were being investigating possible new services to put in the offering for a while, and the call to action coming from a sophisticated and relevant customer occurred just at the right time, finding them "prepared" to seize it.

3.3.2 *The context: people and organization*

As far as organizational choices are concerned, reactive and proactive approaches show interesting differences in how the firm allocates resources on the projects.

Proactive approaches firstly identify a person, in general an internal professional coming from the sales department, that may be appointed to be the "Digital Transformation Manager" (DTM); at the beginning the structure at her/his disposal is quite lean, even if she/he has a blank proxy on the strategic exploration activities related to the new technological applications, regarding which she reports directly to the CEO. She can use some resources (human and physical) pertaining to internal offices (like, typically, the technical office, and the ICT dept.) negotiating duration and intensity with the specific manager in chief. Few stable resources are allocated initially to the venture, and the specific budget is quite limited. Progresses in the project, envisioned applications and the opportunity to develop internally some adaptations of off-the-shelf technologies can change this initial situation, mainly thanks to the abnegation and ability of the manager in chief (the DTM). Consequently, some specific professionals may be then allocated to the project: in case B, for example, a senior and a junior engineer compose the DTM's team. Further additions of people generally follow the gradual acceptance of the new "group" and the new project within the organization (especially at high strategic levels) and are related to competences and technologies necessary to implement mobile applications and data analysis (and in particular its most advanced evolutions of artificial intelligence and machine learning).

In the case of reactive approaches, the stakes at play are much clearer from the beginning and the company reacts promptly to the customer's request allocating resources in order to solve problems and find viable solutions as soon as possible. In case D for example, a new office (not a

new division nor a new company) inside a pre-existent organizational structure (and the traditional business model) has been set up in order to face the challenge of I4.0: it is an “Innovation Centre” composed of 8 people with different competences, that interact with the R&D department in order also to give input for NPD activities. In case B, even if the in-house team is very small (2 people and the DTM), it is regularly connected to a larger group (10 people) that operates directly at the customers’ premises and manages some of the operative tasks necessary to implement the result-oriented PSS. In that case, periodic meetings in-house can play as organizational integration mechanisms in order to align the whole team on the experimentation’s developments.

Both approaches end up reserving the same treatment to organization and human resources when the exploration has reached a certain level of maturity. “*At a certain point you have to go internally*”, says Company A’s Business Development Director, explaining the choice of hiring an expert in data analysis and business intelligence coming from the Apple Academy.

3.3.3 *The client-supplier relation as a prototype*

As we mentioned, no previous experience related to the main strategic challenges posed by the new business model is retrievable in the company’s past or in the industry at large. A high level of uncertainty connotes the adopted solutions and their outcomes, putting firms in a highly risky situation: consequently, a high level of cooperation between supplier and customer is a common trait of the cases. That cooperation takes different forms.

Firstly, in performance-oriented PSS the actual performances depend also from the customer’s cooperation and ability in doing its part of the job. Secondly, the sustainability of the new business model may depend on the availability of the partners to share totally or partially the risks. In case B, for instance, the unprecedented features of contracts (conditions, SLAs, prices) and the disrupting shift in the revenue model, induced the key customer to agree to pay up-front the equipment involved in the pilot project. “*That was the only way to make the outcome-based contracting economically sustainable for us*” says the company B’s CEO. Regarding the sustainability question, one important relational feature that every company underlines regards the length of supply contracts, whose duration must be consistent with the total value of the equipment.

A last aspect that is important to highlight relates to the metamorphosis of the firm’s business model. As far as the outcome of the initial incubation phase and the further use of the experience gathered in the pilot experimentations is regarded, all the four firms testify for a common evolution of business model innovation towards a proactive approach, that involves a sort of replication of the experience for other customers.

4. Conclusions

This study seeks to shed light on how companies that are exploring the disruptive scenario of I4.0 are dealing with the duality posed by business model innovation, in line with directions suggested by the literature on the subject (Meindl *et al.*, 2021).

A first theoretical contribution is made by validating and refining the typology introduced in Figure 1, and regards the topic of disruptive business model innovations. In fact, in the I4.0 scenario: the exploratory process requires higher investments in knowledge, as there is no prior experience to exploit or imitate, and the exploration breadth is high; among the strategies hypothesized by Markides (2013), contextual ambidexterity is currently prevailing in the investigated firms, while at present we cannot foresee the evolution of the experimentation in subsequent phases: a prosecution of the contextual ambidexterity, a spatial separation or an ending of the duality through a business model metamorphosis (see type IV in fig. 1); the innovation impacts directly on the firm’s business model (Paiola and Gebauer, 2020; Paiola *et al.*, 2022 ago nose), and may eventually consist in a metamorphosis of the old business model rather than the addition of a new one.

A further theoretical contribution of the paper concerns contextual ambidexterity, a concept as rich in charm as poorly explored in practice. The main finding of the empirical investigation is that all the challenger firms of our sample adopt a particular form of contextual ambidexterity, that differs from the one hypothesized by Gibson and Birkinshaw (2004) - according to which ambidexterity must be a quality of each individual in the organization - but is aligned with the recent evolution of the construct in the literature (Hu and Chen, 2016; Lavie *et al.*, 2010; Markides 2013; Winterhalter *et al.*, 2016). In fact, our challenger firms have made a selective choice, giving some employees (individually or in groups) the task of exploring the new opportunities through cooperation projects with the most advanced and important customers, maintaining a variable but always important connection to extant resources and competences in the organization. Since exploration involves specifically and uniquely key customers, this solution is a way of “hiding” the new business model inside a dyadic client- supplier relationship. This “hidden” dual business model is clearly a noteworthy strategy in terms of risk management and effectiveness, and cannot be defined as a second-best option for facing I4.0 disruptiveness.

In line with other recent studies, our research shows that firms that live up to meet the I4.0 challenge are still limited to few “fortunate” cases. However, making the title of one of those contributions our own, “fortune favors the prepared” (Müller *et al.*, 2018), underlining the role of strategic culture in preventing firms to make “fortune” with I4.0 (Paiola *et al.*, 2021 prior).

This study has three main limitations owing to its explorative nature. First, we are investigating firms involved in a transition phase: in particular, we can't tell what the outcome of the metamorphosis will be, and if it will be the same for every firm. Second, we didn't observe how contextual ambidexterity works in depth, for example regarding the role of individuals and groups, such as strategic managers (middle- and top-level) and Management Teams (ex. TMT). Third, BtoB manufacturing firms are only a portion, however relevant, of the I4.0 landscape. Clearly, each of these limitations would only be overcome by further research on the relationship between I4.0 and business model innovation.

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Sustainable Entrepreneurship: How the Food Industry is Adapting to Meet the Demand of a Changing World[♦]

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Abstract

Framing of the research. Sustainable entrepreneurship represents an essential concept in business sphere as it allows to decrease both environmental and social impacts and creates opportunities for further business innovations.

Purpose of the paper. The main purpose of the study was to identify attitudes of Slovak agricultural & food companies towards sustainability issues in food supply chain.

Methodology. The research was based on primary data acquired by implementing online questionnaire survey. In total, 82 companies participated in the research. Descriptive statistics and non-parametric tests were applied.

Results. Results showed that 40.43% of companies try to implement activities towards sustainability, 52.4% try to reduce the energy usage 48.8% try to recycle the waste, 39% implement environmentally friendly technologies in logistics and production section, and 24% try to use ecologically appropriate technology in packaging. Moreover, 75.6% employs people from local area, 48.8% offers food and other products of Slovak origin and 36.6% process raw materials from local areas as well as sell fresh food products at their own farm shop. Most companies indicated that they connect their healthy food products to an innovative communication via using social media (59.8%).

Managerial implications. Results provide important insights for policymakers in terms of mapping the situation with implementation of sustainable entrepreneurship in the Slovak agri-food industry.

Research limitations. One of the limitations is the fact that the study involves only preliminary research focused only on a narrow segment of companies in Slovakia.

Key words: Agri-food companies; sustainable activities; Slovakia

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1. Introduction

The food industry has undergone several global changes and challenges, primarily due to growing consumer demand for healthier, safer, and tastier food (Petrescu *et al.*, 2020). Meanwhile, the ongoing Russia-Ukraine crisis significantly impacts food security due to disrupting agricultural production and trade from a major exporting region (Abay *et al.*, 2023). There is a broad consensus about making the food system more sustainable, but there are diverse images of how a future sustainable food system should look like. These perspectives are shaped by discourse, which refers to commonly held understandings of food systems that shape the way we understand habits, opinions, and beliefs of society (De Cock *et al.*, 2016). The continuous improvements in knowledge have driven the creation of food processing methods and individualized nutritional practices (Aguilera, 2018; Knorr *et al.*, 2020; Gan *et al.*, 2019). As observed by Trajkovska Petkoska *et al.* (2021), food industry is facing a challenge to balance environmental concerns with consumers' demands for natural, high quality, and convenient food products. Lavilla and Gayán (2018) and Timmermans *et al.* (2011) underlined that consumers are looking for fresh, natural, minimally processed foods without any additives.

Furthermore, Zhu *et al.* (2018) have found that consumers are willing to pay a premium price for high-quality products that offer exceptional sensory qualities. Personal constraints such as finances, time, and other work-related factors also affect food consumption decisions. On the one hand, price plays a crucial role in food choices; on the other hand, household characteristics can significantly influence food preferences (Reisch *et al.*, 2013). In addition, fluctuating prices of agri-food products can profoundly impact individuals dietary choices, leading them to consume junk food that can have adverse health consequences. Access to healthy and sustainable food should not be limited (Wang *et al.*, 2019). In the context of policymaking to transition towards more sustainable schemes, it is essential to consider local, regional, and national levels (Araújo *et al.*, 2022). This can include promoting sustainable farming practices (De Ponti *et al.*, 2012; Menozzi *et al.*, 2015), developing local food systems (Carrad *et al.*, 2022), or increasing awareness of local and sustainable food (Timpanaro & Cascone, 2022; Borda *et al.*, 2021). By working collaboratively towards these objectives, we can create a system that benefits enterprises and consumers, including supporting the health of our planet.

2. Methodology

The main aim of the manuscript was to identify attitudes of agricultural & food companies towards sustainability issues in food supply chain. The study is based on primary data obtained via online questionnaire survey, which was disseminated during the period of March and May 2022. In total, 82 companies participated in the survey. The characteristics of the participating companies are shown in Table 1. The questionnaire included multiple-choice answers regarding sustainability, local aspects, and impact of the situation in Ukraine. Descriptive statistics and non-parametric tests were applied by using statistical software XLSTAT 2022.4.1.

Tab. 1: Profile of the participating companies

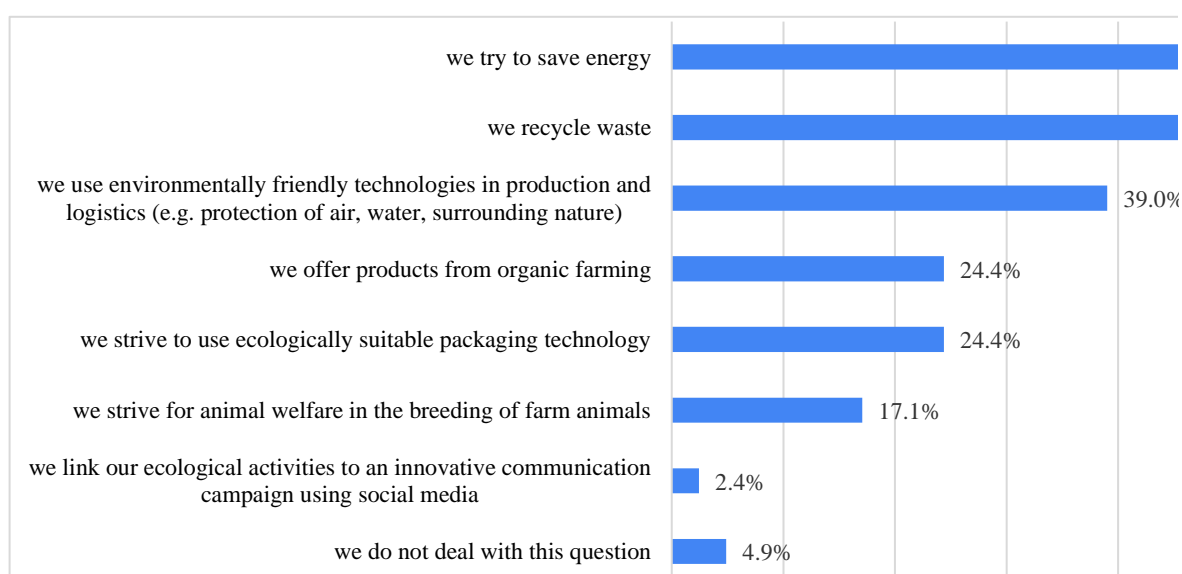
Field of business	Primary production in agriculture	71.95%
	Food production industry	28.05%
Number of employees	1-9	48.78%
	10-49	32.93%
	more than 49	18.29%
Territorial jurisdiction	local	56.10%
	regional	28.05%
	national	3.66%
	international	12.20%

Source: our elaboration

3. Results

The results showed that 40.43% of participating companies stated that they try to implement activities towards sustainability, 23.40% perceive discussion and information from the media about sustainability in agricultural and food production, and 19.15% agreed that there exists discussion about it, however there is a lack of a stronger connection with practical implementation. Approximately 8.51% have not noticed this topic. Moreover, participants were asked several statements related to sustainability and ecological issues (Figure 1). The majority of participating companies indicated that they try to reduce energy usage (52.4%), followed by waste recycling (48.8%), and the implementation of environmentally friendly technologies in logistics and production sections (39%). Approximately 24% of companies stated that they offer organic products and try to use ecologically appropriate technology in packaging. In addition, 17.1% support animal welfare in the breeding of farm animals. Only 4.9% does not deal with this topic, and less than 3% link their ecological activities to marketing communication (social media and campaigns). All in all, nearly 25% of companies rate their awareness of issues related to sustainability in production and consumption, environmental protection, and other topics related to climate protection as insufficient. However, 28% indicated sufficient awareness, and 47% stated that this information can be found by whoever wants to seek them.

Fig. 1: Attitudes towards selected statements related to sustainability issues



Source: our elaboration

Furthermore, the results showed that the majority of companies employ people from local area (75.6%), offer food and other products of Slovak origin (48.8%), process raw materials from local areas, as well as sell fresh food products at their own farm shop (36.6%). Only 4.9% does not deal with this topic. The next questions were related to issues of healthy nutrition. The majority of companies stated that they link their healthy food products to an innovative communication by using social media and campaign (59.8%), as well as produce or offer vegetarian or vegan products (57.3%). Approximately 32% stated that they produce or offer healthy food products (whole grain products containing fiber, vitamins, low-fat foods, fresh fruits and vegetables, healthy meals in the restaurant), and 29% indicated that they produce or offer special nutrition products (for diabetics, gluten-free food, lactose-free food, meals in the restaurant for special nutrition). Offering protein products were mentioned by 15% of respondents. Only 4.9% stated that they offer products with probiotic culture.

In addition, the respondents were asked to evaluate 5 statements using a 7-points Likert scale (1 = totally agree, 7 = totally disagree). In average, the respondents moreless agreed that the Russian-Ukrainian war conflict will have a certain impact on all statements. The highest agreement was with increasing prices of food, and the lowest was with considering the structure of offers and production programs in case of worse economic situation (Table 2).

Tab. 2: Results of multiple pairwise comparisons using Nemenyi's procedure

Sample	Mean of ranks	Groups
Food prices will increase.	2.323	A
The purchase decision will be influenced to a greater extent by the price.	2.744	A B
Our company will be forced to raise prices.	3.000	A B C
People will pay less attention to environmental problems.	3.274	B C
In case of a worse economic situation, we will consider the offer or production program.	3.659	C

Source: our elaboration

4. Discussion and conclusion

The present study contributes to food industry, which globally faces challenges and changes driven by consumers and worldwide crises. Achieving a sustainable food system remains a diverse topic. This study aimed to examine Slovakian agri-food companies' sustainability practices, ecological concerns, and healthy nutrition choices. Based on the results, the majority of the companies indicated that they try to reduce energy usage, followed by waste recycling and implementation of sustainable technologies in logistics and production sectors. The study also revealed the importance of further education and awareness to encourage sustainable practices in the food industry. According to Ghadimi *et al.* (2020), sustainable competitiveness can be maintained through innovation. In Slovakia, agri-food companies predominantly employ local workers and utilize locally sourced raw materials to produce and sell fresh products on their farm shops. They promote healthy food through social media and campaigns. Furthermore, enterprises focus on alternative options such as vegetarian and vegan products, indicating a willingness to meet a changing consumer preference for healthier food options. A study in Slovenia revealed that the acceptance of novel or sustainable foods is heavily influenced by social perception and trust in the social system (Klopčič *et al.*, 2020). However, limited availability of healthy and sustainable food could benefit from expansion and to encourage more companies to adopt sustainable practices. Furthermore, the study highlights the potential impact of the Russian-Ukrainian crisis on the Slovak food industry related to increasing prices due to economic uncertainty and affordability of healthy food options. What should be emphasized - previous studies about Russia-Ukraine war have significantly increased uncertainty for global market (Abay *et al.*, 2023). For example, Headey & Hirvonen (2022) noticed that cost of food and fertilizer had been on the rise even before the war. In conclusion, the study sheds light on the current practices of Slovak agri-food companies concerning local sourcing, healthy food options, and geopolitical events. The outcomes reveal the potential for enhancing healthy food promotion and highlight the significance of community involvement and innovative communication strategies.

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Tecnologie digitali e nuovi modelli di business per le imprese Born Global

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Abstract

Inquadramento della ricerca. *L'applicazione delle tecnologie digitali sta modificando i modelli di business tradizionali, riconfigurando le strutture organizzative e relazioni di quelle esistenti.*

Obiettivo del paper. *Comprendere l'impatto delle tecnologie digitali nel plasmare i modelli di business delle imprese nel loro percorso di internazionalizzazione.*

Metodologia. *Analisi di due casi studio di imprese che hanno sviluppato il loro percorso di internazionalizzazione affidandosi alle tecnologie digitali.*

Risultati. *Le tecnologie digitali e gli strumenti di progettazione collaborativa possono rappresentare la base per nuovi modelli di business che sfruttano le opportunità derivanti dalla crescente connettività di persone e imprese. Emergono nuove tipologie di imprese Born Global, con un ruolo di "digital-based process coordinator", per la gestione di progetti complessi.*

Limiti della ricerca. *Lo studio è stato condotto in un solo Paese e, al suo interno, una sola regione. Sarebbe opportuno che ulteriori studi prendessero in considerazione casi di altre regioni e altri Paesi, nonché settori diversi.*

Implicazioni manageriali. *L'emergere di nuovi ruoli apre spazi di mercato per aziende in grado di offrire servizi specializzati che non si basano solo su caratteristiche tecniche e informatiche, ma coniughino competenze digitali con capacità di coordinamento e relazionali, anche informali, che ancora caratterizzano le interazioni di business.*

Originalità del paper. *Il paper evidenzia come le tecnologie digitali permettono la nascita di nuovi ruoli e nuovi modelli di business in settori tradizionalmente ancorati alla produzione di beni a bassa tecnologia. In questi settori, la digitalizzazione permette di organizzare in modo innovativo il legame fra produttori e utenti finali, anche nella dimensione internazionale del mercato. Le imprese Born Global possono arricchirsi di questo profilo, che ne identifica il ruolo nella base digitale del modello di business.*

Parole chiave: Born Global; imprese digitali; internazionalizzazione; Born Digital

Framing of the research. *The application of digital technologies is modifying traditional business models, reshaping the existing organizational structures and relationships.*

Purpose of the paper. *This study aims to understand the impact of digital technologies in shaping the business models of companies in their internationalization path.*

Methodology. *The analysis approach is based on two case studies of companies that have developed their internationalization path by relying on digital technologies.*

Results. *The results highlight how digital technologies and collaborative design tools can represent the basis for new business models. According to this perspective, new types of Born Global companies can be identified, with a role of "digital-based process coordinator", for the management of complex projects.*

Research limitations. *The study was conducted in only one country and, within it, only one region. Further studies should consider cases from other regions and other countries, as well as different sectors.*

Managerial implications. *The emergence of new roles opens up market spaces for companies able to offer specialized services which are not based only on technical and IT-related skills, but which combine digital skills with coordination and relational skills, even informal ones, which still characterize business interactions.*

Originality of the paper. *The paper highlights how digital technologies allow the emergence of new roles and new business models in sectors traditionally anchored in the production of low-tech goods. The link between producers and end users can be re-organized in an innovative way, even in the international dimension of the market. Born Global companies can enrich themselves with this profile, which can be identified in the digital basis of the business model.*

Key words: Born Global; digital firms; internationalization; Born Digital

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1. Introduzione

Con l'affermarsi delle tecnologie digitali, la loro introduzione nelle imprese è diventata prassi comune e il ruolo delle imprese che operano nel digitale sta diventando sempre più importante nell'economia mondiale. L'applicazione delle tecnologie digitali, a partire da Internet e dall'uso dei dispositivi mobili, sta modificando i modelli di business tradizionali, portando a una riconfigurazione delle strutture organizzative di molte imprese (Chen *et al.*, 2019; Wu and Gereffi, 2018; Monaghan *et al.*, 2020; Vadana *et al.*, 2021; Ye *et al.*, 2022). Uno dei principali cambiamenti riguarda lo sviluppo di piattaforme digitali, come le piattaforme di e-commerce e i social network, che stanno favorendo lo sviluppo internazionale dei mercati, anche per le imprese minori (UNCTAD, 2017; Wu and Gereffi, 2018). Infatti, le tecnologie digitali possono ridurre i costi di espansione commerciale oltre i confini nazionali, riducendo anche i tempi necessari per l'internazionalizzazione. In base a questa tendenza, diversi autori hanno individuato una maggiore presenza di imprese che operano a livello internazionale e che sono caratterizzate da un impiego intensivo di strumenti digitali fin dalla loro fondazione, forgiando la definizione di imprese "Born Digital" (Monaghan *et al.*, 2020).

Dato il ruolo critico delle tecnologie digitali nell'influenzare l'evoluzione dei modelli di business, con questo lavoro si vuole comprendere il ruolo svolto da tali tecnologie con riferimento al modello delle Born Global (BG), rispondendo alla seguente domanda: in che modo le tecnologie digitali plasmano i modelli di business delle Born Global, accelerando la loro espansione nei mercati internazionali?

Per rispondere a questa domanda si è seguito un approccio basato sulla metodologia di casi studio, esaminando due imprese riconducibili alla tipologia delle Born Global, con l'intento di individuare quali elementi peculiari stanno emergendo rispetto al concetto tradizionale di Born Global (Eisenhardt, 1989).

Il lavoro è strutturato come segue. La sezione dedicata alle teorie di riferimento analizza la letteratura sulle Born Global e quella più recente sulle Born Digital, evidenziando le lacune che il nostro studio intende colmare. La parte sulla metodologia descrive l'approccio esplorativo seguito, le ragioni che hanno portato all'adozione di una tecnica di campionamento mirato e illustra i parametri presi in considerazione nella selezione dei due casi aziendali. Nella sezione riguardante i risultati, oltre a mostrare quanto emerso dallo studio dei casi in oggetto, viene messo in evidenza il contributo alla teoria delle Born Global alla luce delle tecnologie digitali. In ultimo, vengono presentate le conclusioni, le implicazioni manageriali, i limiti e le indicazioni per future ricerche.

2. Stato dell'arte

Le imprese Born Global (Cavusgil e Knight 2009; Knight e Cavusgil 2004; Knight e Cavusgil 1996; Knight 2015; Knight e Liesch 2016; Madsen e Servais 1997; Moen 2002; Moen e Servais 2002; Rialp *et al.*, 2005) sono state oggetto di diversi studi che le hanno definite "*fast internationalisers*" (Vissak 2010) in base alla loro capacità di avviare un processo di espansione internazionale fin quasi dalla loro costituzione, entrando simultaneamente in diversi mercati esteri senza prima sviluppare una solida esperienza nazionale (Rialp *et al.*, 2005).

Le Born Global possono essere presenti sia nei settori ad alta tecnologia che in quelli a bassa tecnologia (Taylor e Jack, 2013; Cavusgil e Knight, 2009; Eurofound, 2012; Madsen e Servais, 1997). In particolare, nel caso dell'Italia, è possibile identificare sia imprese Born Global appartenenti ai settori dell'alta tecnologia, del design e delle tecnologie dell'informazione e della comunicazione (ICT), emerse negli ultimi tre decenni, sia Born Global appartenenti a settori più tradizionali, già presenti fin dagli anni '60 e '70 del secolo scorso come imprese familiari situate nei distretti industriali (Pepe e Musso, 2003; Eurofound, 2012; Masili 2022).

Tuttavia, l'ampia gamma di studi sulle Born Global contribuisce in modo frammentario alla letteratura, a causa soprattutto della differenza nei parametri adottati per identificare e studiare i

processi di internazionalizzazione di queste imprese. Per esempio, Rennie (1993, p. 45) definisce le Born Global come “*small to medium-sized companies that successfully compete - virtually from their inception - against large, established players in the global arena*”. Allo stesso modo, McAuley (1999, p. 70) le definisce “*instant internationals*”, un termine che riflette meglio “*the predominantly [...] rapid internationalization*”. Knight e Cavusgil (1996, p. 11) danno una definizione che considera le BG come “*small technology-oriented companies that operate in international niche markets from the earliest days of their establishment*”, sottolineando la loro capacità di sfruttare le risorse basate sulla conoscenza e la vendita di prodotti in diversi paesi per ottenere una maggiore performance sui mercati internazionali.

Un importante contributo all'identificazione delle Born Global è stato dato da Zahra e George (2002), i quali hanno suggerito di definire le Born Global sulla base di tre parametri: 1) Il lasso di tempo che intercorre tra la costituzione dell'impresa e le sue prime vendite all'estero; 2) La percentuale di vendite all'estero e 3) il numero di paesi in cui l'impresa genera vendite. Diversi altri autori (Gabrielsson *et al.*, 2008; Kuivalainen *et al.*, 2007; Kuivalainen *et al.*, 2012) hanno ulteriormente contribuito, proponendo un modello di internazionalizzazione delle start-up molto simile, basato sulle stesse tre tipologie di parametri. In particolare, Kuivalainen *et al.*, (2012) hanno suggerito un elenco di indicatori fra cui, per esempio, quello di considerare almeno cinque paesi target come riferimento per valutare il terzo parametro. Pertanto, in base ai contributi forniti che nel corso del tempo hanno arricchito la letteratura, le Born Global possono essere identificate come imprese che iniziano un percorso di internazionalizzazione entro il terzo anno dalla loro nascita, realizzando almeno il 25% del fatturato totale all'estero ed esportando in almeno cinque paesi nello stesso arco di tempo (Masili, 2022).

La forte vocazione internazionale delle Born Global (McDougall 1989) viene incentivata dalla riduzione delle barriere culturali e geografiche (Knight e Cavusgil, 2004), favorita dall'avvento di Internet e delle ICT (Rialp *et al.*, 2005). Non va comunque dimenticato che l'esperienza e i network di relazioni dei fondatori sono altrettanto importanti, così come l'implementazione di strategie innovative che includono l'adozione di tecnologie e strumenti digitali, come le piattaforme 3D (Masili, 2022). Infatti, l'introduzione di queste tecnologie influisce positivamente, non solo sulla comunicazione con i clienti e gli stakeholder a livello internazionale (Cavusgil e Knight, 2009), nonché sull'integrazione e il coordinamento delle attività di marketing, ma anche e soprattutto sui processi produttivi, attraverso la digitalizzazione delle catene di fornitura.

Il peso della tecnologia è oggi molto rilevante, tanto che integrare le nuove tecnologie con le tradizionali strategie di impresa risulta inevitabile (Caliskan *et al.*, 2020). Infatti, con la cosiddetta quarta rivoluzione industriale - o Industria 4.0 - nuove strategie di business hanno iniziato a prendere forma, capaci di collegare persone, macchine e oggetti per migliorare l'efficienza produttiva e coinvolgere i clienti in tutti i processi (Bettiol *et al.*, 2017). In questo mutato scenario, vengono utilizzate diverse tecnologie e applicazioni, sia nei processi interni che nei rapporti esterni all'impresa. Per esempio, l'internet delle cose (IoT), la realtà aumentata (AR), il cloud computing e l'intelligenza artificiale (AI) forniscono conoscenze sulle esigenze dei clienti (Agrawal *et al.*, 2018; Ghaffari *et al.*, 2020), mentre la robotica e i sistemi cyber-fisici consentono di migliorare le prestazioni produttive delle imprese (Yeo *et al.*, 2017; Bienhaus and Haddud, 2018). Un ruolo importante è svolto anche dai “configuratori di prodotto” (Parlangeli *et al.*, 2019) che possono essere visti come strumenti di dialogo tra produttori e clienti, permettendo di implementare una strategia di personalizzazione di massa (Franke and Schreier, 2010).

I configuratori possono essere classificati in vario modo in base al settore e all'utente cui si rivolgono. I configuratori rivolti ai clienti finali possono essere suddivisi in tre sottogruppi basati su altrettante tipologie di personalizzazione: a) funzionale, b) estetica e c) su misura (Walcher and Piller, 2012; Walcher and Miksovsky, 2016). Considerando le relazioni business-to-business (B2B), i configuratori possono essere visti anche come componenti di uno strumento di automazione della forza vendita (Mahlamaki *et al.*, 2019), coinvolgendo un'ampia gamma di soluzioni che possono supportare la riduzione dei costi e/o migliorare l'efficacia delle relazioni con clienti e fornitori (Speier and Venkatesh, 2002).

In base alle tendenze emergenti, la letteratura più recente (Chen *et al.*, 2019; Wu and Gereffi, 2018; Monaghan *et al.*, 2020; Nambisan *et al.*, 2019; Piqueras, 2020; Stallkamp *et al.*, 2021; Vadana *et al.*, 2019; Vadana *et al.*, 2021; Veglio *et al.*, 2020; Ye *et al.*, 2022), identifica la categoria delle imprese digitali in quelle che fanno leva su un'estesa presenza digitale, intesa come presenza online, basando i propri processi operativi e logistici su Internet (Ye *et al.*, 2022) attraverso un modello di business a base digitale (Monaghan *et al.*, 2020). Le imprese digitali vengono classificate in quattro categorie (UNCTAD 2017; Wu e Gereffi, 2018): i) le piattaforme internet e ii) i fornitori di soluzioni digitali - interamente operanti in un ambiente web - iii) le imprese di e-commerce e iv) le imprese di contenuti digitali - che combinano dimensioni digitali con una dimensione fisica (Tab. 1). Considerando la loro natura globale, le imprese digitali possono essere viste come un sottoinsieme delle Born Global, identificate in letteratura con il termine di “Born Digital” (Monaghan *et al.*, 2020).

Tab. 1: Caratteristiche delle imprese digitali

Categorie di imprese digitali	Piattaforme Internet	Soluzioni digitali	E-commerce	Contenuti digitali
Caratteristiche principali	- Imprese nate in un contesto digitale. - Tutte le attività vengono gestite su Internet.	- Operatori basati su internet e abilitatori digitali.	- Piattaforme online che consentono transazioni commerciali. - Il contenuto della transazione può essere digitale (intangibile) o fisico (tangibile).	- Produttori e distributori di beni e servizi in formato digitale. - Beni e servizi possono essere forniti sia attraverso Internet che attraverso altri canali.
Esempi	Motori di ricerca, social networks e altre piattaforme di condivisione.	Servizi di pagamento elettronici, operatori cloud e altri fornitori di servizi.	Retailer via internet e agenzie di viaggio online.	Media digitali (video, TV, music, e-books), giochi elettronici, data analytics.
Tipo di player	Puramente digitale	Puramente digitale	Misto	Misto

Fonte: elaborazione degli autori su dati UNCTAD (2017) e Wu & Gereffi (2018)

Secondo Ye *et al.*, (2022) le imprese Born Digital hanno tre caratteristiche principali. In primo luogo, sfruttano i vantaggi delle tecnologie digitali fin dalla loro fondazione e sono costruite su infrastrutture come computer, dispositivi mobili e rete Internet. L'infrastruttura digitale fornisce a queste imprese una presenza online identificabile che si trova nel “cyberspazio” (Wu e Gereffi, 2018). Esse hanno anche “luoghi fisici” come uffici, magazzini o datacenter (Nambisan *et al.*, 2019). Questa relazione “spazio-luogo” è una caratteristica che distingue le imprese Born Digital da quelle manifatturiere tradizionali. Pur essendo simili alle imprese manifatturiere tradizionali in termini di necessità di investimenti di capitale per attività fisiche (impianti), le Born Digital tendono ad avere un rapporto molto più alto fra intensità di attività via internet e beni fisici rispetto alle imprese tradizionali.

In secondo luogo, le Born Digital tendono a operare online e quindi sono caratterizzate da una forte componente virtuale (Chen *et al.*, 2019). Si affidano alle infrastrutture digitali per sviluppare e acquisire capacità di comunicazione, collaborazione e trattamento di dati. Queste capacità consentono all'impresa di creare, commercializzare e vendere la propria offerta attraverso un modello di business digitale.

In ultimo, le Born Digital sono integrate nella alla rete (Stallkamp *et al.*, 2021). Le tecnologie digitali forniscono a queste imprese i mezzi per integrarsi con attori diversi e complementari all'interno del loro network (Monaghan *et al.*, 2020). È più probabile che i prodotti e i servizi delle imprese Born Digital siano intangibili e quindi che le loro transazioni commerciali siano meno vincolate dalla distanza geografica, basandosi piuttosto sulla dimensione delle loro reti di utenti, generando così un effetto rete (Chen *et al.*, 2019).

Sulla base di queste considerazioni e della mancanza di letteratura sull'impatto delle tecnologie digitali sui modelli di business delle imprese Born Global, questo studio si concentra sulle Born Global altamente digitalizzate con l'intento di comprendere l'impatto delle tecnologie digitali nel plasmare i loro modelli di business e nell'influenzare il loro percorso di internazionalizzazione.

3. Metodologia

Per comprendere l'impatto delle tecnologie digitali sui modelli di business delle Born Global, abbiamo adottato un approccio per casi studio (Yin, 2018; Tellis 1997). Tale approccio è particolarmente appropriato per la sua flessibilità (Eisenhardt 1989) e per la possibilità di poter adottare diverse procedure di raccolta dati (Creswell e Creswell 2018; Vissak *et al.*, 2017) assecondando l'esigenza di ottenere maggiori approfondimenti empirici su tematiche non ancora pienamente indagate. Per questo motivo, è stato deciso di adottare un approccio esplorativo, particolarmente adatto a rispondere alle domande riguardanti il come e il perché di un determinato fenomeno (Eisenhardt 1989; Welch *et al.*, 2011; Yin 2018) soprattutto laddove le conoscenze sull'argomento sono ancora ridotte (Yin 2018).

Dati lo scopo e gli obiettivi dello studio, è stata adottata una tecnica di campionamento mirato (Patton 2001) per la selezione dei casi aziendali, data l'importanza di identificare degli informant chiave che potessero aiutare a individuare i casi più ricchi di informazioni (Palinkas *et al.*, 2015; Suri 2011; Patton 2001). La selezione dei casi ha quindi riguardato soggetti che hanno espresso la disponibilità e la volontà di partecipare alla ricerca comunicando le loro esperienze in merito a situazioni ritenute significative per la comprensione del fenomeno in esame (Palinkas *et al.*, 2015).

In base alla natura globale delle imprese e al loro percorso digitale, la selezione dei casi ha seguito quattro criteri: 1) lo sviluppo di un processo di internazionalizzazione entro i primi tre anni dalla costituzione dell'impresa; 2) il 25% sul fatturato totale delle vendite all'estero; 3) l'esportazione in almeno cinque paesi (Kuivalainen *et al.*, 2012); 4) un percorso di internazionalizzazione coadiuvato, fin dall'inizio, dall'adozione di tecnologie digitali.

L'inclusione del quarto parametro ha facilitato l'identificazione e la selezione di due Born Global che hanno costruito il loro percorso di internazionalizzazione affidandosi a diverse tecnologie digitali, le quali, a loro volta, hanno contribuito a plasmare il loro modello di business.

Le imprese selezionate hanno sede in Italia e operano in settori tradizionali (calzature e arredamento). La scelta dei settori tradizionali per i casi da analizzare è dovuta alla necessità di verificare se questi settori, che non dipendono da tecnologie avanzate per quanto riguarda le caratteristiche dei prodotti e il rapporto con i clienti, possano essere influenzati dalle tecnologie digitali nei loro percorsi di sviluppo internazionale.

Per quanto riguarda la raccolta dei dati, si è optato per l'utilizzo di più fonti al fine di soddisfare il principio di triangolazione che garantisce la validità dello studio (Yin 2018). Sono stati raccolti dati primari attraverso interviste semi-strutturate (Saunders *et al.*, 2019) di durata variabile fra i 50 e i 60 minuti. Le interviste sono state registrate e poi trascritte e integrate con fonti di dati secondari, come siti web aziendali e altro materiale fornito direttamente dagli intervistati (per esempio, i report interni).

Con specifico riferimento all'analisi dei dati, dopo la stesura dei due casi, la codifica dei dati è stata effettuata in modo indipendente e poi discussa fra i ricercatori (Ghauri 2004).

4. Descrizione dei casi

4.1 Caso Alpha

L'impresa Alpha è stata fondata nel 2015 all'interno del distretto calzaturiero Fermano-Maceratese, nelle Marche. Il distretto è composto principalmente da artigiani indipendenti e imprese artigianali altamente specializzate in ogni fase della filiera calzaturiera, dalle soles fino ai prodotti finiti. I tre fondatori dell'impresa hanno avuto l'idea di creare un'azienda digitale con l'obiettivo di vendere scarpe personalizzate di alta qualità. Per farlo, fin dalla sua fondazione l'azienda ha deciso di mettere in contatto un gruppo di imprese artigiane del distretto con i clienti finali di tutto il mondo, utilizzando una piattaforma di e-commerce proprietaria.

Il marketplace aziendale comprende sei sezioni, la più importante delle quali è dedicata ai diversi modelli e collezioni disponibili. Altre sono dedicate all'artigianalità e alla sostenibilità dei prodotti

calzaturieri e al livello di personalizzazione possibile, che secondo uno dei fondatori coincide con una “personalizzazione Made-to-Measure (MtM)”. MtM significa un livello di personalizzazione che raggiunge il 100%, dal tipo di suola, alla pelle, fino al colore dei lacci e delle mascherine delle scarpe. È presente anche una sezione “blog”, contenente una guida di stile per il corretto abbinamento dei prodotti dell’azienda nella vita quotidiana.

La sezione e-commerce è multilingue e multi valuta; è consultabile in sei lingue (italiano, francese, tedesco, cinese, giapponese e coreano) e i prezzi possono essere convertiti direttamente in quattordici valute (Dirham degli Emirati Arabi Uniti, Dollaro australiano, Dollaro canadese, Franco svizzero, Yuan cinese, Sterlina britannica, Yen giapponese, Won sudcoreano, Ringgit malese, Rublo russo, Corona svedese, Dollaro di Singapore, Grivna ucraina, Dollaro statunitense), ognuna corrispondente ai principali mercati di riferimento dell’azienda.

Il modello di business si basa su alcuni strumenti digitali fondamentali di proprietà dell’azienda. Internamente, l’azienda utilizza un sistema di gestione degli ordini (OMS), ulteriormente supportato da un software di pianificazione delle risorse aziendali (ERP), grazie al quale gli ordini dei consumatori finali vengono inoltrati direttamente alle imprese artigiane. Dal lato dei consumatori, il configuratore 3D dà loro un’idea chiara dell’estetica completamente personalizzata delle calzature disponibili. A supporto di ciò, l’azienda ha sviluppato un’applicazione mobile per la misurazione del piede che calcola la misura della pianta del piede del cliente utilizzando la fotocamera dello smartphone, rendendo così l’esperienza di acquisto online il più fluida e intuitiva possibile. Queste tecnologie hanno permesso all’azienda di esportare i propri prodotti in tre diversi continenti fin dall’inizio, raggiungendo il 50% del totale del fatturato nel primo anno di attività (Tab. 2).

Nel 2017, seguendo un approccio multicanale, l’azienda ha deciso di ampliare i propri canali di distribuzione, stringendo partnership con negozi di abbigliamento tradizionali specializzati in articoli di alta sartoria. La ricerca di partner si è concentrata non solo all’interno dei mercati (paesi) già serviti, ma anche in aree in cui l’azienda non era presente, perseguendo così una strategia di moltiplicazione dei mercati. Oggi l’azienda vanta 39 partner commerciali in 21 paesi. All’interno dei negozi, viene allestita una sezione con un campionario di prodotti dell’azienda, che il cliente è libero di esplorare. Dopo aver valutato il prodotto e determinato la taglia più adatta, il consumatore può iniziare il processo di personalizzazione utilizzando un totem dedicato o il proprio smartphone, scansionando il codice QR che si trova accanto all’articolo da acquistare. In questo modo, il cliente è in grado di completare la transazione anche in un secondo momento, decidendo dove farsi consegnare il prodotto.

Uno dei punti di forza del progetto è nella tempistica di realizzazione delle calzature acquistate, che nel caso di prodotti fatti su misura rappresenta sempre un aspetto critico. Grazie a un efficiente coordinamento dei fornitori, ottimizzato grazie alle tecnologie digitali, l’impresa è riuscita a ridurre i tempi di spedizione a 10 giorni, riscontrando notevoli vantaggi in termini di soddisfazione dei clienti e reputazione.

4.2 *Caso Beta*

L’impresa Beta è un “interior general contractor” specializzato nella realizzazione di progetti immobiliari riguardanti sia edifici a uso pubblico (es. hotel, uffici, ristoranti, ospedali), sia residenze private. È stata fondata nel 2016 e si trova all’interno del distretto del mobile di Pesaro, nelle Marche, che può vantare un’antica tradizione di artigianato manifatturiero nella produzione ed esportazione di mobili “Made in Italy”. L’impresa è stata fondata sulla base delle precedenti esperienze dell’imprenditore maturate all’interno del distretto, partendo dal fatto che per i produttori, supportare le forniture a grandi acquirenti nel campo dell’arredamento (le cosiddette forniture “contract”) stava diventando sempre più complesso a causa dei crescenti livelli di precisione e affidabilità richiesti dai clienti. Questa problematica ha lasciato spazio a specialisti per gestire la complessità delle relazioni che caratterizzano un progetto di interior design, puntando sulle opportunità offerte dalle nuove tecnologie. I primi clienti dell’azienda, che fin dall’inizio sono stati internazionali, sono stati portati dagli stessi produttori di mobili locali.

L'impresa offre un servizio di contracting chiavi in mano in tutto il mondo, supportando i clienti dalla progettazione alla realizzazione del progetto fino al suo completamento. I clienti sono studi di architettura e società immobiliari che devono gestire progetti immobiliari completi di tutti gli arredi interni, compresi gli elementi decorativi come quadri, soprammobili e complementi d'arredo. A partire dal progetto, il compito dell'azienda è quello di organizzare tutti i fornitori e coordinare il loro lavoro in modo da rispettare i tempi e la sequenza degli interventi. Le competenze dell'azienda riguardano la consulenza in materia di *value engineering* (Gunarathne *et al.*, 2022) e i servizi di approvvigionamento. Il primo fornisce un supporto per lo studio della fattibilità e l'analisi dei costi di tutti gli elementi del pacchetto di arredo inteso come Fixture and Equipment (FF&E) e Operating Supplier & Equipment (OS&E), ed è rivolto agli operatori B2B. Il secondo è un servizio di supporto alla fornitura, che è un ramo diretto del primo. Queste attività sono gestite attraverso il "Building Information Modeling" (BIM) (Azhar, 2011; Volk, Stengel e Schultmann, 2014) che è un sistema informativo digitale dell'edificio costituito da modelli 3D integrati con i dati fisici, prestazionali e funzionali della struttura. Il BIM rappresenta un sistema informativo dinamico, interdisciplinare e condiviso sull'intero ciclo di vita del progetto immobiliare, dalla progettazione alla costruzione fino alla demolizione e allo smantellamento. Per gli arredi interni, la metodologia BIM consente agli appaltatori di coordinare l'incastro di tutti i componenti dell'arredo, compresi i collegamenti con gli impianti idraulici (per bagni e cucine) e le forniture elettriche e di gas. Ciò consente di ridurre drasticamente gli errori dei produttori quando realizzano elementi di arredo sulla base di ordini che con i sistemi tradizionali sono soggetti a imprecisioni o errori, anche perché i prodotti sono solitamente personalizzati e deve essere garantita l'esatta corrispondenza delle misure al momento dell'installazione.

Negli anni successivi allo sviluppo iniziale, i rapporti che si sono creati con i clienti internazionali hanno reso possibile l'espansione del mercato, con una logica basata sulla valorizzazione delle competenze specialistiche dell'impresa, che ha portato a perseguire una strategia di crescita, seppure caratterizzata da gradualità.

Tab. 2: Il profilo delle imprese

	Caso Alpha	Caso Beta
Settore	Calzature	Servizi
Competenze	Calzature personalizzate	Business and Strategy Management; Value Engineering and Procurement
Fondazione	2015	2016
Anno di internazionalizzazione*	2015	2016
Primi paesi*	USA, Germania, Francia, GB, Giappone, Corea del Sud, Cina	Russia, USA, UAE, Uzbekistan, Greece
Paesi nel 2022	Albania, Austria, Canada, Croazia, Repubblica Ceca, Francia, Germania, Grecia, Irlanda, Giappone, Kazakistan, Malesia, Mongolia, Qatar, Slovacchia, Corea del Sud, Spagna, Svizzera, Emirati Arabi Uniti, GB, USA	Albania, Cipro, Croazia, Grecia, Montenegro, GB, Emirati Arabi Uniti, Uzbekistan
% delle vendite all'estero sul fatturato totale*	50%	100%
% delle vendite all'estero nel 2022	90%	95%
Strategia di internazionalizzazione	Strategia di moltiplicazione	Strategia di Moltiplicazione
Tecnologie adottate	Sistema di gestione degli ordini (OMS) Software di pianificazione delle risorse aziendali (ERP) Configuratore 3D	Building Information Modelling (BIM)

* Entro tre anni dalla fondazione

5. Risultati e discussione

Ciò che emerge dai due casi analizzati è che le nuove tecnologie digitali stanno permettendo la nascita di nuovi modelli di business all'interno di due settori tradizionali, coinvolgendo gran parte delle dinamiche relative ai processi produttivi, alle catene di fornitura e ai canali di marketing.

L'impresa Alpha agisce come aggregatore di processi che velocizza il ciclo ordine-produzione-distribuzione, con l'ulteriore vantaggio che attraverso un marketplace comune le aziende manifatturiere sono in grado di acquisire una visibilità che sarebbe più debole se perseguita individualmente. Il modello di business si basa in questo caso sul sistema make-to-order (MTO). Adottando questo modello, l'azienda gestisce un processo produttivo in cui la produzione di un articolo inizia solo dopo aver ricevuto un ordine dal cliente finale. Questo approccio consente di ridurre notevolmente sia le vendite a saldo, sia le scorte di magazzino. Tuttavia, è importante specificare che, per avere successo, il sistema MTO deve necessariamente essere associato a un processo produttivo efficiente e veloce e a una gestione attiva della domanda, curando la relazione con il potenziale cliente, dal primo contatto fino all'atto di acquisto (Hendry, 1998).

Il configuratore 3D permette di gestire il processo di acquisto online attraverso la personalizzazione del prodotto (MtM), che diventa un fattore di forte competitività per l'impresa. Inoltre, la soluzione del configuratore presenta il potenziale per ulteriori sviluppi tecnologici. In particolare, l'adattamento alla morfologia dei piedi del cliente sta diventando un'area di innovazione attraverso la modellazione fotografica, ossia attraverso sistemi di scansione per misurare l'esatta conformazione dei piedi del cliente. In questo senso, la personalizzazione andrebbe ben oltre le semplici soluzioni estetiche, come la scelta di colori e materiali.

L'azienda, pur essendo classificabile a tutti gli effetti come impresa di e-commerce, opera come qualcosa di diverso da un semplice e-retailer, in quanto riesce a mettere in contatto diretto i clienti finali con i produttori, coordinando le attività dei produttori stessi e velocizzando i processi di personalizzazione. Allo stesso tempo, svolge anche un ruolo diverso dal semplice supporto promozionale che potrebbe avere un'agenzia o un consorzio di promozione delle esportazioni, poiché non limita il suo modello di business all'aggregazione di più produttori a fini promozionali, ma integra i processi partecipando a tutte le attività legate allo sviluppo dell'ordine.

Il percorso di sviluppo internazionale dell'azienda può essere identificato come una *market spreading strategy* (Katsikeas *et al.*, 2020), anche se i vincoli logistici legati a costi e condizioni di consegna dei prodotti tendono a limitare il numero di Paesi potenzialmente aggredibili. In effetti, l'azienda è in grado di guardare a un numero molto ampio di mercati, in linea con una strategia di nicchia che associa la qualità della lavorazione alla personalizzazione e, non da ultimo, all'immagine della calzatura "Made in Italy".

L'impresa Beta è un esempio delle nuove specializzazioni che lo sviluppo delle tecnologie digitali permette di sviluppare e in alcuni casi, come quello considerato, richiede, portando all'emergere di attori internazionali che non trovano riscontro nei tradizionali ruoli all'interno delle catene del valore. Il percorso evolutivo dell'azienda merita attenzione. Nasce come fornitore di servizi di project management per un distretto industriale, le cui aziende fornivano i contatti per avviare relazioni internazionali con architetti e imprese di costruzione. Successivamente, il modello di business cambia e l'impresa inizia a porsi come punto di riferimento per i clienti stranieri nella ricerca di fornitori per completare progetti di arredamento d'interni. Oggi l'azienda può identificarsi come un produttore, anch'esso MtM, che fornisce un'ampia gamma di prodotti avendo completamente esternalizzato le fasi di produzione, concentrandosi sul proprio core business, ovvero la gestione dei progetti per conto di clienti esteri.

Per sviluppare la propria offerta, l'azienda si basa soprattutto sul BIM, un insieme di tecnologie, processi e metodi che consentono a diversi partner di progettare, costruire e gestire in modo collaborativo un progetto di costruzione in un ambiente virtuale. Come sottolineato nel paragrafo precedente, il BIM rappresenta una rappresentazione virtuale dell'edificio, un'accurata riproduzione digitale di ogni singolo componente, che consente attività di controllo e analisi durante l'intero processo edilizio, permettendo l'estrazione di quei dati e documenti necessari durante le fasi di

progettazione, costruzione e gestione. L'adozione del BIM - e di conseguenza della sua metodologia di lavoro - consente all'impresa di adottare una forma di progettazione aperta, collaborativa e integrata, portando a numerosi vantaggi economici e strategici.

Da un punto di vista economico, il BIM consente rilevanti risparmi in termini di costi e tempi rispetto al tradizionale processo di progettazione assistita da computer (CAD). Infatti, i costi di un progetto aumentano durante la fase di realizzazione a causa di errori quasi sempre causati da difetti di comunicazione fra i vari soggetti coinvolti. Il BIM permette di prevenire le difformità e, allo stesso tempo, in quanto strumento dinamico, permette di verificare le possibilità di modifica al progetto riallineando tutti i processi. Un modello virtuale che contiene tutte le informazioni sull'edificio consente il controllo e l'analisi di tutte le attività durante il suo intero ciclo di vita. Si tratta quindi di un grande vantaggio, che consente una progettazione efficiente, riducendo gli errori e ottimizzando i tempi di costruzione.

Da un punto di vista strategico, l'adozione del BIM ha implicato per l'impresa la possibilità di lavorare in parallelo su un numero più elevato di progetti da clienti privati e amministrazioni pubbliche in tutto il mondo. Infatti, sono sempre più numerosi i casi di Paesi che richiedono l'uso di specifici strumenti elettronici per le informazioni sui progetti di edificazione e altrettanti quelli che hanno reso il BIM obbligatorio per partecipare ad appalti pubblici.

In generale, è possibile affermare che l'adozione delle nuove tecnologie da parte delle due imprese esaminate ha portato a un cambiamento radicale del loro modello di business, ponendole in una posizione di confine fra il ruolo di produzione e quello di distribuzione. Mentre alcuni di questi cambiamenti fanno rientrare il caso dell'azienda Alpha nella categoria delle imprese digitali (in particolare le imprese di e-commerce), lo stesso non si può dire per l'impresa Beta. Sebbene il modello di business di quest'ultima sia stato modificato dall'adozione del sistema BIM, non può essere collocato in una categoria ben definita tra quelle proposte da Wu e Gereffi (2018). Il suo ruolo potrebbe essere identificato come una sorta di "digital-based process coordinator", che agisce con una posizione centrale nella gestione di progetti complessi.

6. Conclusioni

I risultati di questo lavoro mettono in evidenza che l'adozione di piattaforme online, configuratori di prodotto e strumenti collaborativi per la gestione dei progetti ha un forte impatto sullo sviluppo di modelli di business volti ad accentuare la capacità delle imprese di aprirsi a livello internazionale. Da un lato, l'approccio digitale dell'impresa Alpha evidenzia la possibilità di espandere la propria base di clienti in tutto il mondo, sfruttando la sua piattaforma di e-commerce online e un configuratore MtM che offre la possibilità di raggiungere un'elevata personalizzazione estetica. Più in dettaglio, l'adozione di configuratori facilita la scelta di prodotti che meglio si adattano alle esigenze dei clienti favorendo una migliore relazione. Inoltre, rifacendosi alla letteratura (UNCTAD 2017; Wu and Gereffi, 2018), l'impresa Alpha può anche essere classificata come Born Digital e, più precisamente, come un'impresa di e-commerce che adotta una piattaforma online associata alla distribuzione dei prodotti nei negozi fisici.

Dall'altro lato, beneficiando del sistema BIM, l'impresa Beta ha costruito il proprio modello di business attorno a un formato di progettazione aperto, collaborativo e integrato, concentrandosi sulla gestione di progetti complessi come core business (Chan *et al.*, 2018), identificandosi in una nuova categoria di impresa Born Digital, quella di "digital-based process coordinator". L'approccio seguito dall'impresa Beta garantisce la qualità e allo stesso tempo la flessibilità dei progetti, assicurando anche l'efficienza della loro gestione in misura tale da compensare il costo derivante dall'adozione del sistema BIM.

Ciò che accomuna entrambi i casi è il fatto che lo sfruttamento delle tecnologie digitali ha permesso la nascita di nuovi ruoli e nuovi modelli di business in settori tradizionalmente ancorati alla produzione di beni materiali a bassa tecnologia. In questi settori, le tecnologie digitali esprimono il loro potenziale nella connessione delle attività della catena del valore, permettendo di

organizzare in modo innovativo il legame fra produttori e utilizzatori finali. Nei due casi considerati, la forte specializzazione richiesta per svolgere l'attività di coordinamento e connessione giustifica questi nuovi ruoli che possono trovare la piena espressione del loro potenziale nella dimensione internazionale del mercato. Da questo punto di vista, le Born Global possono certamente arricchirsi di questi profili, che identificano la loro caratterizzazione nella base digitale dell'impresa.

Le implicazioni per il management sono significative. Da un lato, l'emergere di questo tipo di imprese apre nuovi spazi di mercato per le aziende in grado di offrire servizi specializzati che non si basano solo su caratteristiche tecniche e informatiche, essendo capaci di coniugare competenze digitali con capacità di coordinamento e relazionali che richiedono una precisa conoscenza ed esperienza dei settori in cui le aziende operano, compresa la capacità di gestire le relazioni di rete sia attraverso i canali innovativi/digitali, sia attraverso le relazioni tradizionali e informali, che ancora caratterizzano i rapporti fra imprese.

Un'ulteriore indicazione può essere tratta con riferimento alle imprese manifatturiere, che dovrebbero assumere risorse umane adeguate e dotarsi di attrezzature tecnologiche (soprattutto applicativi) per interagire efficacemente con i nuovi ruoli di mediatore/coordinatore individuati in questo studio. Un'altra valutazione che può essere fatta dalle imprese produttrici è se e in che misura possano incorporare parte delle funzioni svolte dai casi analizzati, decidendo quali fasi, eventualmente, possono internalizzare per conservare valore all'interno dei loro processi.

Questo lavoro presenta alcuni limiti, il primo dei quali consiste nel fatto che lo studio è stato condotto in un solo Paese e, al suo interno, in una sola regione. Sebbene questo non rappresenti necessariamente un elemento che possa inficiare i risultati del lavoro, trattandosi di una fase esplorativa, sarebbe opportuno che in ulteriori studi venissero presi in considerazione casi di altre regioni e altri Paesi, nonché di settori diversi. Indubbiamente, la fase esplorativa dovrebbe essere proseguita per arricchire la varietà dei casi considerati, portando a ipotesi più complete che potrebbero costituire la base per successive analisi quantitative, volte a misurare la rilevanza del fenomeno e la sua diffusione.

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Stakeholders Perception towards Family Firm Brands: The Influence of Family Firms CEO Identity

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Abstract

Framing of the research. *Family business literature has extensively investigated the role played by CEO identity (i.e., family vs. nonfamily CEO). A relatively limitedly explored area of research considers the influence that CEO identity has on the external stakeholders' perception of family firms' brand.*

Purpose of the paper. *This study extends research on family firms' heterogeneity by exploring the role of CEO identity in relation to the way external stakeholders talk about the brand of the family firm s/he leads - i.e., brand importance.*

Methodology. *Using text mining and social network analysis techniques, we analyze 52,555 news articles published in 2017 about 63 Italian family firms.*

Results. *Results demonstrate a positive relation between the presence of a nonfamily CEO managing the family firm and brand importance, which is negatively moderated by firm's longevity.*

Research limitations. *First, not all online news is readily and openly accessible. This limits our study to be cross-sectional and we thus do not assert causation. Second, the data used in our empirical study are from Italy, which may restrict the generalizability of our findings.*

Managerial implications. *Our results highlight that family firms get benefits in terms of brand importance attributed by stakeholders when being led by a nonfamily CEO. Nevertheless, the presence of a nonfamily CEO is preferable only for less long-lived family firms.*

Originality of the paper. *This study contributes to research on family firms' heterogeneity by offering an alternative perspective on the influence of family leadership on external stakeholders' perception of family firm brands.*

Keywords: *family firm; CEO identity; firm longevity; brand importance; semantic brand score*

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1. Introduction

Family business literature has extensively investigated the role played by family CEOs opposite to nonfamily ones. According to family business literature, the CEO identity (i.e., being a family vs. nonfamily member) plays a significant role in corporate leadership and explains differences in corporate strategy and performance amongst family firms (Miller *et al.*, 2013). So far, among others, scholars have focused their attention on performance implications in terms of commitment to family firms' long-term goals, expertise, R&D intensity and risk adoption (e.g., Gomez-Mejia *et al.*, 2003; Sciascia and Mazzola, 2008). A relatively less explored area of research considers instead the influence that CEO identity has on the external stakeholders' perception of family firms' brand. Tackling this aspect is important because, on the one hand the CEO is the individual who represents the firm externally; on the other hand, the importance that external stakeholders attribute to family firms' brand is crucial to advance our understanding of how these stakeholders can affect consumer choices that lead to the firm's competitive advantage.

To address this pressing topic, we investigate whether CEO identity associates to the way external audiences talk about the brand of the family firm s/he leads. In so doing, we build on *brand importance*, which is a new construct that points to the relevance a brand has in a discourse given the richness and uniqueness of its image, its visibility, and the possibility to act as a bridge connecting different discourse topics (Rovelli *et al.*, 2022, p. 694). Moreover, making a step forward, we also investigate whether this relation is affected by firm longevity, as detected by firm generation. To achieve our aim, we analyze data on 63 Italian family firms, which we gathered from balance sheets, news articles, and other secondary source of information. To investigate stakeholders' brand perception, we use social network and semantic analysis methods on a sample of 52,555 news articles published in 2017 about these family firms.

Results demonstrate a positive relationship between the presence of a nonfamily CEO managing the family enterprise and brand importance, supporting our hypothesis. According to our research, nonfamily CEOs running family businesses are more likely to be regarded as having superior managerial abilities and specialized knowledge by external stakeholders. This would thus explain the favorable correlation between a higher brand importance and having the brand be seen as having more brand equity and expertise from the outside. However, our data also show that this positive relationship is dependent on the family firm's longevity, as measured by firm generation. In particular, the longevity of the family business has a negative impact on the positive effect that the professional expertise associated with the presence of a nonfamily CEO has on brand importance. This can be explained by the fact that a family CEO might be more highly regarded by external stakeholders as having the ability to uphold the family business's tradition and promote brand importance. On the other hand, external stakeholders could prefer the presence of an external leadership when the family business is still developing and thus unable to benefit from a permanent legacy. These findings contribute to family business literature by offering an alternative perspective on external audiences' perception of family firms' brand by taking into consideration the role of CEO identity.

2. Theoretical background and hypotheses development

Firm leadership represents an important aspect of family firm heterogeneity. In family business literature, firm leadership has been examined from various perspectives (Arzubiaga *et al.*, 2018; Kraus *et al.*, 2011; Xi *et al.*, 2015). Within this stream of literature, most of the studies to date focus on how the family is involved in business decisions and who owns the company (Chrisman *et al.*, 2005; Sharma, 2004; Tagiuri and Davis, 1996), dedicating most of the attention to the role that family members play both in family management and family ownership (Stewart and Hitt, 2012). However, in recent years, the growth of the family business field has encouraged academics to

widen their emphasis beyond family members and to explore other actor groups working in family enterprises, giving birth to a new line of research.

This growing stream of literature has concentrated efforts on investigating the relative effectiveness of family vs. nonfamily CEOs as top executives (Miller *et al.*, 2014). These studies have compared the impact of CEO identity (i.e., whether the CEO belongs to the family owning the firm or not) on firm performance in terms of commitment to family firms' long-term goals (Sciascia and Mazzola, 2008; Zellweger, 2007), knowledge, competence, experience and expertise (Bloom and Van Reenen, 2007; Chrisman *et al.*, 2014; Jaskiewicz *et al.*, 2017; Miller *et al.*, 2014), as well as R&D intensity and risk adoption (Gomez-Mejia *et al.*, 2003). Nonetheless, although the extant literature has recognized that the CEO is considered "the most powerful individual in the organization" (Busenbark *et al.*, 2016, p. 258) and the individual who ultimately represent the firm to the public, an external perspective on how heterogeneity in firm leadership affects stakeholders' perception of the firm is largely lacking. To address this pressing topic, we investigate whether CEO identity associates to the way external audiences talk about the brand of the family firm s/he leads. To do so we rely on the concept of *brand importance*.

Tab. 1: Definition of brand importance and its components

Concept	Definition
Brand importance	The relevance a brand has in a discourse given the richness and uniqueness of its image, its visibility, and the possibility to act as a bridge connecting different discourse topics.
Prevalence	How frequently a brand is mentioned in a discourse (the higher the frequency, the higher the prevalence).
Diversity	How much a brand is associated with heterogeneous and unique words in a discourse (the richer the discourse, the higher the lexical diversity).
Connectivity	How frequently a brand bridges connections between words that are not directly connected (the higher the number of bridging connections, the higher the brand's connective power).

Source: Rovelli *et al.* (2022)

Brand importance is a relatively new construct comprising the three dimensions of prevalence, diversity, and connectivity as defined in Table 1 (Fronzetti Colladon, 2018). These dimensions are related to the well-known brand knowledge and equity models (Keller, 1993; Wood, 2000). In detail, *prevalence* points to how often a brand name is mentioned in a discourse, capturing its visibility, and offering an indication of its awareness (Aaker, 1996; Keller, 1993). A high prevalence suggests that news readers will recall and recognize a brand. *Diversity* is linked to the concept of heterogeneity of brand associations and therefore related to brand image (Keller, 1993) capturing the variety and uniqueness of words mentioned in association with a brand. Heterogeneous associations are usually preferred, as they show the brand is embedded in a richer discourse (Fronzetti Colladon, 2018), contributing to brand strength (Grohs *et al.*, 2016). The third dimension, *connectivity*, represents the extent to which a brand can bridge connections between words that are not directly connected. As Fronzetti Colladon (2018, p. 152) highlights "connectivity could be considered as the 'brokerage' power of a brand, i.e. its ability of being in-between different groups of words, sometimes representing specific discourse topics".

2.1 CEO identity and brand importance

Past literature suggests that, in most cases, hiring a nonfamily CEO results in an improvement in knowledge, competence, and managerial expertise of the firm. Indeed, a nonfamily CEO may bring into the family firm a superior managerial talent that may not be present in the small pool of family member candidates (Miller *et al.*, 2013; Miller *et al.*, 2014). The appointment of a nonfamily CEO, in fact, helps family businesses in expanding their knowledge base and improving their capacity to recognize and seize lucrative economic possibilities (Baldwin *et al.*, 2015; Block, 2011; Chirico, 2008). Besides, governance research recognizes the distinct and superior managerial competence of nonfamily CEOs, suggesting a greater contribution to effective strategy making when their skills are

used in decision making (Belhassen and Caton, 2009; Chirico, 2008; Chrisman *et al.*, 2004; Hall and Nordqvist, 2008) and acknowledging that nonfamily CEOs are generally more openly oriented toward the external environment (Baldwin *et al.*, 2015; Block, 2011).

On the contrary, current research highlights that family CEOs have little cognitive exposure to the outside world because most of their professional expertise is gained within the family business. Empirical evidence shows in fact that family CEOs have far longer tenures than nonfamily CEOs (James, 1999), which results in higher cognitive constraints (Gomez-Mejia *et al.*, 2003) and a dedication to the status quo at the price of innovation and change (Hambrick and Fukutomi, 1991). Long tenures have been proved to stifle creativity and innovation (Kellermanns and Eddleston, 2004), breeding cognitive rigidity, while restricting the capacity to envision new opportunities and encouraging the preservation of the status quo (Finkelstein and Hambrick, 1990; Hambrick and Fukutomi, 1991). For these reasons and according to this line of research, we contend that external stakeholders are likely to associate family firms managed by nonfamily CEOs with the idea of superior managerial competence and professional expertise. This in turn would reflect on the brand, which is externally perceived as stronger in terms of brand equity and knowledge. We thus posit:

H1. The presence of a nonfamily CEO positively relates to family firm's brand importance.

2.2 The moderating role of firm's longevity

We argue that the relation in Hypothesis 1 is affected by the family firm's longevity, represented by firm generation. Specifically, the positive influence that the professional expertise connected with the presence of a nonfamily CEO we expect to have on brand importance might be negatively affected by the family firm's longevity. A longest-lived family firm is indeed typically perceived as more attached to its own tradition and its well-established organizational culture based on strongly embedded organizational values. A family CEO would thus be better valued by external stakeholders as able to protect the family firm's tradition, fostering brand importance, exacerbating the range of branding association that the literature ascribed to family firms, including being traditional, dependable, local, socially conscious, long-term oriented, or community- and customer-oriented (Anderson and Littrell, 1995; Astrachan *et al.*, 2018; Botero *et al.*, 2018; Sageder *et al.*, 2018).

Contrarily, when the family firm is in its early stages of development and thus could not leverage on a long-lasting heritage, external stakeholders would value more the presence of an external leadership. An external CEO is indeed expected to provide additional professional competences, which are particularly needed in early stages of development to ensure the firm's survival and growth. Therefore, considering young family firms, external stakeholders would value more the presence of an external CEO rather than a family one, weakening the hypothesized relation.

H2. The firm longevity negatively moderates the relation between the presence of a nonfamily CEO and family firm's brand importance.

3. Methodology

3.1 Data collection

To investigate the role of CEO identity in stakeholders' brand perception and the moderating role of firm longevity, we relied on a sample of Italian family firms, which we identified among those listed in the Forbes' 2018 ranking of the Top 100 Italian entrepreneurial families and their businesses¹. Following Micelotta and Raynard (2011), this type of firm is indeed of particular relevance for our aim because entrepreneurial families (and their businesses) are well renowned for

¹ <https://forbes.it/classifica/100-famiglie-impreditoriali-italiane-forbes/>

their entrepreneurial orientation (Sieger *et al.*, 2011; Zellweger *et al.*, 2012), which in turn affects their orientation toward their brand (e.g., Chang *et al.*, 2018). As in a previous study by the authors, we excluded 32 of the 100 family firms in the list because the name of their brand easily associates with famous individuals or products other than the firm, or because more than one firm exists with the same name. We gathered data on firms' characteristics using firms' balance sheets from the AIDA database managed by Bureau van Dijk as well as coding information from secondary sources (e.g., firm's website). We then retrieved from Telpress International B.V. textual data of Italian online news articles - consisting in the articles of major online newspapers, press agencies and information websites in Italy - published in the year 2017. We considered all the articles that mentioned at least once the firms in our sample, for a total of 52,555 documents. We then used these news articles to the purpose of measuring family firms' brand importance with the Semantic Brand Score indicator (Fronzetti Colladon, 2018). Due to missing data, the final sample consisted of 63 firms.

3.2 Data collection

The dependent variable of this study is *brand importance*, which we measured by means of the Semantic Brand Score (SBS) indicator as in a previous study by the authors. The SBS is a novel composite indicator applicable to any textual data, which considers the three dimensions of brand *prevalence*, *diversity* and *connectivity* and is calculated combining methods and tools of text mining and social network analysis (Fronzetti Colladon, 2018). Specifically, *prevalence* measures how frequently a brand name occurs in the text, under the assumption that brands that are mentioned more frequently are more important, as they generate higher awareness (Keller, 1993) from both the writer's and the reader's perspective. Because a brand name might be mentioned very frequently, but always in association with the same low-informative words, prevalence is combined with *diversity*. This second dimensions of the SBS considers the heterogeneity and uniqueness of the textual brand association. Its computation is based on the social network graph based on the co-occurrence of words in the text.

The g-graph is made by n nodes (corresponding to each word appearing in the text) and m arcs interconnecting the nodes, which are weighted according to the frequency of the co-occurrence of every node pair. As suggested in prior literature, we considered 5 as a threshold for the maximum co-occurrence distance² (Fronzetti Colladon, 2018) and we filtered out rare co-occurrences (i.e., links with low weights). We measured *diversity* as the distinctiveness centrality metric considering this graph (Fronzetti Colladon and Naldi, 2020): the distinctiveness is higher when a brand (node) has more links (i.e., more associations), and when these associations are less common. Finally, the third dimension of the SMS is *connectivity*, which reflects the brand's ability to act as a bridge, connecting other words and discourse topics. In other words, *connectivity* measures the "brokerage power" of the brand in the co-occurrence network, and it is operationalized through the weighted betweenness centrality (Wasserman and Faust, 1994).

The SBS indicator results from the sum of the standardized measures of prevalence, diversity, and connectivity. To calculate the SBS, we first preprocessed the news data (i.e., documents) to drop: (1) words that add little meaning to the text (stop-words, e.g., "and", "or"); (2) word affixes (known as stemming) (Porter, 2006); and (3) punctuation and special characters (Perkins, 2014). We used the SBS BI webapp³ (Fronzetti Colladon & Grippa, 2020) for all the natural language processing, brand associations, and SBS computation tasks⁴.

The main independent variable is *nonfamily CEO*, a dummy variable equal to one if the CEO does not belong to the family owing the firm. As for the moderating factor, we measured firm

² In line with previous studies (e.g., Fronzetti Colladon, 2018), the results did not significantly differ when repeating the analysis with a different threshold (i.e., 7).

³ <https://bi.semanticbrandscore.com>

⁴ The computing resources were provided by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), as we used a version of the app hosted on the ENEA/CRESCO infrastructure (Iannone *et al.*, 2019)

longevity by means of the *firm generation*, which indicates the family generation that is managing the firm.

Finally, we included in our analysis several control variable as in similar studies in family business literature (e.g., De Massis *et al.*, 2021; Rondi and Rovelli, 2022). *Firm size*, which we measured in terms of number of employees working in the firm, *firm age*, *geographical area dummies*, which indicate whether the family firm is located in the North-East, North-West, Centre or South of Italy, and *industry dummies*, which point to whether the firm operates in manufacturing, services or constructions.

4. Results

Tab. 2: Descriptive statistics and correlations (p-values in parentheses)

	Mean	S.D.	(1)	(2)	(3)	(4)	(5)
(1) Brand importance	0.693	4.689	1.000				
(2) Nonfamily CEO	0.397	0.493	0.346 (0.005)	1.000			
(3) Firm generation	4.286	5.754	-0.118 (0.357)	-0.029 (0.820)	1.000		
(4) Firm size	2159.175	5465.239	0.348 (0.005)	0.201 (0.114)	-0.092 (0.472)	1.000	
(5) Firm age	103.667	111.005	0.024 (0.851)	0.059 (0.644)	0.792 (0.000)	-0.028 (0.826)	1.000

Source: our elaboration

Table 2 presents descriptive statistics and correlations of the variables of our study. *Brand importance* appears to be significantly and positively correlated with the presence of a *nonfamily CEO* ($\rho = 0.346$, p-value = 0.005), which is in line with the direction of our Hypothesis 1, while it does not significantly correlate with *firm generation*. *Nonfamily CEO* and *firm generation* are not significantly correlated as well.

Tab. 3: Results of the empirical models testing the relation between nonfamily CEO and brand importance, and the moderating effect of firm generation

	Model 1		Model 2		Model 3		Model 4	
	coef.	p-value	coef.	p-value	coef.	p-value	coef.	p-value
Nonfamily CEO	-		0.426 (0.188)	0.027	0.384 (0.187)	0.045	0.638 (0.216)	0.005
Firm generation	-		-		-0.041 (0.027)	0.135	-0.039 (0.023)	0.101
Nonfamily CEO * Firm generation	-		-		-		-0.064 (0.020)	0.002
Firm size	0.306 (0.051)	0.000	0.251 (0.059)	0.000	0.246 (0.055)	0.000	0.232 (0.056)	0.000
Firm age	0.004 (0.075)	0.962	-0.000 (0.093)	0.997	0.174 (0.143)	0.230	0.326 (0.136)	0.020
Geographical area dummies	YES		YES		YES		YES	
Industry dummies	YES		YES		YES		YES	
Constant	-1.228 (0.631)	0.057	-0.725 (0.527)	0.175	-0.650 (0.516)	0.213	-0.334 (0.516)	0.521
Observations	63		63		63		63	
Log-likelihood	-60.08		-56.86		-55.21		-53.10	
R-squared	0.234		0.309		0.344		0.386	

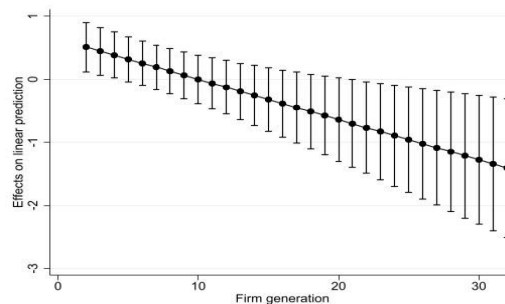
Robust standard errors in parentheses.

Source: our elaboration

Table 3 reports the results of the OLS models we used to test the hypothesis of this study. Before running the models, we performed variance inflation factor (VIF) tests, which excluded multicollinearity issues. Indeed, the maximum VIF is 2.83, and the average VIF is 1.85, which are both below the thresholds generally associated with multicollinearity problems (Belsley *et al.*, 1980). Moreover, we standardized all continuous variables to ease the comparison of the resulting coefficients.

The first model is the baseline including only control variables. In this model it emerges a positive and significant relation between *firm size* and *brand importance* (coef. = 0.306, p-value = 0.000), suggesting that larger family firms are associated to a better stakeholders' brand perception. In Model 2 we added the independent variable *nonfamily CEO*. Results confirm Hypothesis 1. The model indeed shows that *brand importance* is higher when the family firm is led by a *nonfamily CEO* (coef. = 0.426, p-value = 0.027). This indicates that the presence of a nonfamily CEO leading the firm associated to a greater stakeholders' perception of the family firm's brand. Model 3 considers also the effect of *firm generation*, as a proxy of firm's longevity. While the latter does not significantly associate with *brand importance* (coef. = -0.041, p-value = 0.135), the positive relation between *nonfamily CEO* and *brand importance* is still in place, even if with a lower level of significance (coef. = 0.384, p-value = 0.045). Finally, in Model 4 we tested the moderating effect of *firm generation* on the relation between the presence of a *nonfamily CEO* and *brand importance*; to interpret the results of the moderation, we used the Delta method (Hoetker, 2007) and computed Average Marginal Effects (AMEs). Results confirm Hypothesis 2, showing a negative and significant moderating effect (p-value = 0.002). Interestingly, while *nonfamily CEO* positively and significantly relates to *brand importance* when *firm generation* is equal or lower than 4 (thus for youngest family firms), Figure 1 shows that this relation turns to be negative and significant for values of *firm generation* equal or greater than 17 (thus for longest-liver family firms). This result suggests that firm longevity negatively moderates the relation between the presence of a nonfamily CEO and stakeholders' brand perception to the point that this latter relation turns to be negative.

Fig. 1: Average marginal effects of nonfamily CEO on brand importance at different levels of firm generation (95% confidence interval)



5. Discussion and conclusion

In this research, we study family firm leadership by adopting an external perspective and exploring the relation between the role of CEO identity - i.e., family vs. nonfamily CEO - and brand importance. In line with previous studies on family firm branding strategies (Micelotta and Raynard, 2011), we analyzed a sample of 63 Italian entrepreneurial families and their businesses. We assessed these firms' brand importance through text mining and social network analysis techniques - i.e., the SBS indicator (Fronzetti Colladon, 2018) - considering 52,555 Italian online news articles about their brands. Confirming our hypotheses, results reveal a positive relation between the presence of a nonfamily CEO leading the family firm and brand importance. Our study suggests that nonfamily CEOs managing family businesses are likely to be perceived by external stakeholders as having superior managerial skills and professional knowledge. This would then

explain the positive association with a greater brand importance, that means having the brand externally perceived to have greater brand equity and knowledge.

Nevertheless, our findings also reveal that this positive relation is contingent upon the longevity of the family firm, as represented by firm generation. Specifically, the positive influence that the professional expertise connected with the presence of a nonfamily CEO has on brand importance is negatively affected by the family firm's longevity. This could be explained by the fact that a family CEO might be more highly regarded by outside stakeholders as being able to uphold the family business's tradition and foster brand importance, thereby enhancing the variety of branding associations that the literature ascribed to family firms (e.g., being traditional, dependable, local, socially conscious, long-term oriented, or community- and customer-oriented). Contrarily, external stakeholders might instead enjoy the presence of an external leadership more when the family firm is in its early stages of development and hence could not benefit from a long-lasting heritage.

This study contributes to research on family firms' heterogeneity by offering an alternative perspective on the influence of family leadership on external stakeholders' perception of family firm brands. Specifically, with our study we aim to reach a better understanding of family vs. nonfamily CEOs' external perception as a source of family firms' heterogeneity. Moreover, by adopting an external perspective and gathering data from various media sources, we were able to throw new light on how the CEO of a family business is perceived by external audiences while also acknowledging the role of media as external stakeholders (Beck, 2016).

Additionally, by using SBS to examine family firm brands, we move past the conventional application of surveys, case studies, interviews, or focus groups (Aaker, 1996; Keller, 1993; Lassar *et al.*, 1995), presenting a fresh (big data) strategy based on the discourse analysis of a sizable number of online news articles. Our approach enables automatic, repeatable measurements to track the value of a brand over time. We think that our study takes advantage of the possibilities provided by the availability of rich internet text data and adds more proof that can encourage family business researchers. The adoption of big data techniques by practitioners to aid in their decision-making processes should also be encouraged.

Our study has some limitations that open up opportunities for future research. First, not all online news is readily and openly accessible, especially when there are large downloads involved. Telpress International helped us collect data by sharing their dataset of articles for 2017, which forced us to conduct a cross-sectional analysis of the data. As a result, we do not assert causation but rather offer proof of the noteworthy connections between our key variables. We encourage academics to replicate our methods over a longer time, even though we are certain of the high caliber and dependability of our findings. In fact, a longitudinal study might be beneficial to better understand the links under investigation. Second, the data used in our empirical study are from Italy, which may restrict the generalizability of our findings.

Indeed, there may be some cultural variation in the relation between the presence of nonfamily CEO and stakeholders' brand perception, as well as on the moderating effect of firm's longevity. Scholars might thus expand our work considering additional nations with different a culture than Italy. Third, our study did not allow us to separate different categories of outside media sources (in other words, different type of stakeholders). It was not possible to determine whether the investigated relations change depending on the kind of external media that wrote and published the articles despite our analysis of textual data from online articles from various sources (i.e., newspapers and news agencies). To gain a deeper understanding of the diversity of external stakeholders' perceptions of family firm brands, we invite scholars to investigate the role of various media sources in the relation between CEO identity and the brand perception of these sources.

Regardless of limitations, our work offers some advises to family firm manager to foster the perception that stakeholders may develop toward their brand. Our results highlight the importance of the identity of the individual who is appointed as CEO. Specifically, family firms get benefits in terms of the importance attributed by stakeholders to their brand when being led by a nonfamily CEO. This suggests that a certain level of professionalization can be beneficial for family firms. Nevertheless, the presence of a nonfamily CEO is preferable only for less long-lived family firms.

Results indeed suggest that stakeholders might value the family firm's brand better when these firms are at maximum at their 4h generation. At this stage, a nonfamily CEO is perceived to better fit the needs of a young firm that requires professional competence to survive and grow. For long-live family firms - i.e., at least at their 17th generation - it is instead preferable to appoint a family member as CEO. In this stage of the family firm's life, stakeholder would indeed better value the presence of a family CEO able to protect the family firm's tradition.

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GREENING THE FUTURE

An Empirical Study on the Relationship between Industry 4.0 and Environmental and Social Sustainability in the Italian Ceramic Industry

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Abstract

Framing of the research. *Industry 4.0, also referred to as the fourth industrial revolution, is centred around technological advancements that enhance production efficiency but also have both positive and negative impacts on the environment and individuals.*

Purpose of the paper. *The purpose of this study is to investigate the link between Industry 4.0 and environmental and social sustainability. The research focuses particularly on the Italian ceramic sector since it is a labour-intensive sector with high levels of pollution and energy consumption.*

Methodology. *Quantitative methodology based on longitudinal analysis and computation of normalized indices.*

Results. *The findings of the study indicate that the adoption of new technologies in the Italian ceramic industry has resulted in a positive impact on both the environment and the workforce.*

The results show that the implementation of Industry 4.0 has led to a reduction in emissions and energy consumption, while also increasing employability. This suggests that the advancements in technology that define Industry 4.0 can help industries become more sustainable, both environmentally and socially.

Research limitations. *The Analysis is focused on the study of the specific Italian ceramic sector, thus making impossible a generalization that would be achievable through a cross-sector study.*

Managerial implications. *This is a crucial finding, as industries around the world are seeking to become more sustainable, and this study provides valuable insights into how Industry 4.0 can play a role in achieving this goal.*

Originality of the paper. *Alternative view to the common idea that implementation of new technologies can substantially negatively impact the environment and people.*

Key words: *Industry 4.0; Environmental sustainability; Particulate Emissions; Energy Consumption; Social sustainability; Employment stability; Italian Ceramic Industry*

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1. Introduction

Industry 4.0 is a term that encompasses a multitude of technological advancements that are transforming the way businesses operate. These advancements encompass a wide range of areas, including the Internet of Things (IoT), artificial intelligence (AI), 3D printing, and cloud computing (Buguin, 2013). The rapidly advancing information and intelligence technologies of Industry 4.0 have led to a significant increase in production efficiency, allowing for more accurate process control, real-time maintenance, real-time machine monitoring, and reduced machine downtime (Ibarra, 2018; Rüßmann, 2015; Lee, 2015; Reis, 2017). This, in turn, creates new opportunities for companies to improve their operations (Hofmann, 2017; Kiel, 2017; Müller, 2018a).

While the implementation of these new technologies has the potential to bring about significant benefits at the corporate level, its impact on the environment and other stakeholders is less well understood. On one hand, these technologies can lead to a more controlled and optimized production process, but on the other hand, they also increase competitiveness and productivity, leading to increased emissions and pollution (Ghobakhloo, 2020). This trade-off must be carefully considered and analysed in order to determine the overall impact that Industry 4.0 will have on the environment.

The potential impact of Industry 4.0 on social sustainability, particularly in terms of job stability, is also an important area of study. Many people believe that new technologies contribute to higher rates of unemployment (Birkel, 2019), and it will be interesting to see if this is supported by data in the context of the Italian ceramic sector, which is one of the largest producers of ceramics worldwide.

Despite the growing interest in the topic, the available literature on Industry 4.0 and its impact on environmental and social sustainability have some limitations. Most of the studies that have been conducted are not specifically focused on high-impact industries, but instead examine the industry as a whole or focus on businesses in general. Furthermore, there has been little research specifically focused on the Italian context and the circumscribed sector of the ceramic industry.

To address this gap in the literature, the current study aims to conduct a quantitative analysis of the specific case of the Italian ceramic industry, with a focus on the positive and negative impacts that Industry 4.0 may have on environmental and social sustainability.

The study begins with a review of the relevant literature, providing a general overview of the theory and different positions held by scholars on this topic. Subsequent sections outline the research approach, including the assumptions and calculations used to extract relevant information from the data. Finally, the results obtained are discussed in order to highlight any similarities or differences with what has been reported in the literature. Through this study, it will be possible to determine whether the findings from previous studies on the relationship between new technologies and environmental and social sustainability can be extended to the high-polluting and labour-intensive Italian ceramic sector.

2. Background and Literature Review

The most important milestone in the digitalization process of manufacturing companies is represented by the fourth industrial revolution, the so-called Industry 4.0 (Li, 2017). Industry 4.0 refers to several technological innovations that can be implemented within a company affecting different fields such as the Internet of things (IoT) artificial intelligence (AI), 3D printing (Buguin, 2013), and cloud computing.

The concept of industry 4.0 is a transversal topic, that can affect several business areas and can be studied from different disciplines. However, from a strategical point of view, it may be defined as follows: *“Industry 4.0 refers to the integration of Internet of Things technologies into industrial value creation enabling manufacturers to harness entirely digitized, connected, smart, and decentralized value chains (Prause, 2017) able to deliver greater flexibility and robustness to firm competitiveness and enable them to build flexible and adaptable business structures, [acquiring] the permanent ability for internal evolutionary developments to cope with a changing business environment (Koether, 2006)”*.

2.1. Synergies Between Industry 4.0 and Environmental Sustainability

According to experts, the advent of the fourth industrial revolution and the digitization of industry presents a variety of prospects for the reduction of emissions (Ford, 2016; Kamble, 2018).

It boosts production’s effectiveness and adaptability, cuts waste, and lowers each product’s carbon emission index (Jin, 2017). Industry 4.0 also brings opportunities for the development of new business models, that enable the transition from mass production to mass customization and even product individualization (Müller. J, 2018b), which will further contribute to the sustainability of the environment and society (Cai, 2019).

The usage of new technologies supports industries toward the implementation of sustainable manufacturing, which can be defined as a production model that reduces negative environmental impacts while transforming materials into products using new technologies and skills (Madu, 2001).

According to the US Department of Commerce, sustainable manufacturing means creating manufactured materials with minimal negative environmental impacts and through economically reasonable means; such means should conserve energy and natural resources while also being safe for personnel, society, and consumers (InternationalTradeAdministration, 2017). In general, sustainable production is a comprehensive strategy that assesses the environmental impact of industrial manufacturing and provides performance metrics (Chris Yuan, 2012). Sustainability is appropriate for the implementation of an organizational scheme of new methods, measures, and technologies in manufacturing to deal with global resource scarcity, relieve environmental pressure, and enable an environmentally friendly product life cycle.

The Duinker & Greig (2007) operational scenarios can help us better understand the way new technologies can change the way industries’ operations impact environmental sustainability.

The operation scenario refers to the way companies transform inputs into outputs, with a focus on the production goals gained through the implementation of Industry 4.0 and the advantages provided, even in sustainability fields, by the underlying technologies (Stock., 2018).

The implementation of Industry 4.0 technology trends, such as IoT, additive manufacturing, cloud service, and data analytics, as well as the development of design principles of Industry 4.0, such as smart manufacturing and product personalization, has been connected with various positive operational effects, such as (Dalenogare, 2018; Kamble., 2019; Wang, 2016) (i) material flow optimization, (ii) better time to market of products, (iii) manufacturing space and facility optimization, (iv) resources efficiency, (v) reduction of waste, (vi) superior product innovation and quality, (vii) improved production capacity and reliability, (viii), strategic adaptability, and (ix) lower inventory costs.

Furthermore, new technologies enhance process control measures, facilitate real-time maintenance, monitor machine performance in real-time, improve scheduling effectiveness,

and decrease machine downtime to increase production efficiency and output (Lee, 2015; Reis, 2017). However, the most significant benefit of industrial automation is the reduction of human intervention, which lowers risk, lowers human error, and raises safety concerns (Chen, 2017; Lu, 2018), which would mean that low-skilled jobs (probably) are lost.

2.2. Synergies Between Industry 4.0 and Social Sustainability

Digitization can have an impact also on people. Indeed, it has resulted in rapid, even disruptive, changes in the majority of businesses and, consequently, upcoming competitive industry environments.

Work roles are frequently reorganized because of new business models and strategies, which can lead to changes in satisfaction, work/life balance, and worker autonomy.

These dimensions can significantly impact a worker's willingness to stay within the company thus increasing or reducing the number of workers in the industry, and also revealing that even the decision of the singular company belonging to a specific industry can impact the industry as a whole.

Job satisfaction can be defined as an individual's overall feeling for their job and their attitudes toward various aspects of their job, as well as an approach and perception that may impact the level of connection between an individual and their employer (Lumley, 2011).

Human resource management methods that support the use of technology to build high-performance work systems are used by organizations that have reaped significant benefits from the use of new technologies. To encourage and improve employees' use of new technologies, work, reward systems, programs, and training need to be recognized (Ratna, 2016).

Work/life balance, according to Lockwood (2003), is "*a state of equilibrium in which the demands of a person's work and personal life are equal*".

The employee viewpoint focuses on how an employee can balance work and personal/family obligations; the employers should be encouraged to foster a supportive company culture in which employees can concentrate on their job while at work (Lockwood, 2003).

Many technological devices that could be used in the future have been developed in recent years, however, whether they raise or decline workload and stress is debatable.

It is widely acknowledged that new technologies led to a growing number of more efficient and smooth operations.

An example is the possibility to access personal computers at home for job purposes, but this represents a double-edged sword.

The benefit of using new tech in leisure time is obvious; an individual can choose whether or not to work for job while at home (Ratna, 2016).

Employee autonomy, also known as work autonomy, refers to how much control employees have over their work settings (Hackman, 1976).

For example, cloud computing is a significant factor in centralized information storage to be accessed in a decentralized way. This allows employees to communicate more quickly and easily, and share work-related knowledge from different locations and in real-time.

Similarly, Gibbs (2017) stated that innovative ICT adds value to a new useful work organization that includes greater autonomy in terms of work hours, or different tasks.

A most relevant aspect that can affect strongly the employment dynamics in the sector under study is that: industrial robots, autonomous vehicles, and intelligent machines are replacing humans in a variety of tasks in the Industry 4.0 environment, including product delivery, inventory tracking, and quality control (Frey, 2017; Zheng, 2018). Many low- to medium-skilled jobs are predicted to be lost as a result of automation due to Industry 4.0,

although this loss will be partially offset by the abundance of new jobs in informatics, mechatronics, process engineering, and system integration (Ghobakhloo., 2019). The consequences of Industry 4.0 for social sustainability go beyond just the opening of jobs in the digital sector. Industry 4.0 and the digitization of the manufacturing sector support a greener and more sustainable economy, creating millions of chances for work in sustainable manufacturing.

3. Risks of Industry 4.0

However, the changes generated by the advent of new technologies cannot be considered exclusively positive; in fact, negative effects on the environment and people can also be originated.

For what concerns the impact on the environment and people it was identified the following aspects:

3.1. Ecological Risk

New machines are required to transform the firm's value chain, and their manufacture necessitates the procurement of raw materials.

The application of Industry 4.0 technology also results in high energy consumption. It is debatable whether the efficiency gains from digitalization outweigh the financial costs of energy. Furthermore, businesses will become increasingly reliant on energy producers and suppliers, and consequently on their prices.

Furthermore, Industry 4.0 implementation necessitates the use of Industry 4.0-compatible machinery and equipment within an enterprise.

Another point is that the idea of "lot size one", mass customization, and a high level of individualization cannot be viewed solely in a positive light. A higher level of product standardization includes the ability to repurpose the product, such as reselling it.

However, the more personalized a product becomes, the more difficult it is for another company or individual to reuse it. As a result, with non-standardized products, waste may increase, and recycling may become more difficult (Birkel, 2019).

3.2. Social Risk

Employees anticipate a shift in the required skills within companies in the future. If employees are not able to quickly adapt, they may lose their jobs. The integration of Industry 4.0 may result in an increase in the social gap, not being sure of what will happen to those who fail to comply with new work requirements.

To successfully transform an organization, the structure must be adapted to the Industry 4.0 requirements.

As a result, successful organizational transformation is critical, and it must be done thoroughly while respecting the personal interests of different stakeholders in the existing structure.

Appropriate communication within the firm, particularly from management and senior staff, must be established; as well as delivering to existing employee on-the-job training and apprentice training. On-the-job training is expected to face employee resistance and gaps in existing jobs. However, IT-inclined trainees are defined as rare and difficult to find in the market (Birkel, 2019).

Hence it seems that the way singular entities of the same industry will behave can strongly impact performances that are registered by the whole industrial sector thus reducing the number of people employed in the industry environment.

4. The Context of the Italian Ceramic Industry

Even in the specific field of ceramics, what scholars theorized finds direct application. Ceramic tile manufacturing emits a variety of hazardous materials such as chemicals, gases, and wastes that directly affect the environment and indirectly affect human livelihood (Gahm, 2016; Gabaldón-Estevan, 2016); when those hazardous materials come into direct contact with humans, it has a direct impact on their health.

Furthermore, the ceramic industry is based on an energy-intensive production process. Indeed, the huge amount of energy needed can come from renewable resources or non-renewable resources, thus causing, also in this case, a direct impact on the environment.

Also from the employment perspective, it is quite interesting to see whether a sector that has been affected by an employment decrease over the years (ConfindustriaCeramica, 2020) has suffered or enjoyed the implementation of new technologies.

It seems quite relevant to deepen the understanding of the impact that the implementation of new technologies belonging to the concept of Industry 4.0 can generate on the environmental and social performances in the Italian ceramic industry sector.

5. Methodology

The study draws on a quantitative methodology based on longitudinal analysis to evaluate the impact of Industry 4.0 on environmental and social sustainability performances attained by the Italian ceramic sector.

During the first phase, a longitudinal database with secondary data, gathered from Confindustria Italia, - *Statistical Surveys of Italian Industry* - was created. It contains up-to-date and detailed information about the sector, e.g., production, revenue, and investment.

In order to verify relevant changes over time, the data considers a timespan of 15 years for selected variables, i.e., particulate emissions, energy consumption, productivity, capital goods investments, and employment.

Data is provided in both absolute and relative terms to better understand and interpret the findings, including year-by-year changes and calculating conjectural variations. In the second stage, correlation analysis was computed.

Lastly, in order to create a homogeneous output, normalized indices have been computed to assess the performances environmental and social performances achieved by the ceramic industry in Italy.

6. Empirical analysis

A major manufacturing sector in Italy is the production of ceramic tiles. Italian tile sector managed to produce 344 million square meters of tiles in 2020 despite the pandemic crisis. Since one square meter of tiles requires around 20 kilogram of natural raw materials, this industry uses 6.88 tons of mineral resources (such as clays, feldspars, and sands). These figures demonstrate how resource-intensive the ceramics industry is.

According to the European Commission's findings, despite the use of energy-intensive and resource-intensive processes, ceramic companies are characterized by a wide diffusion of

digital technologies and virtuous environmental policies and have the ability to respond quickly to changes in demand and new market opportunities (Appolloni, 2022), which makes them an appropriate sector for the purpose of the study.

As showed in Table 1 the selected variables for the analysis are the Investment in capital goods, Particulate emissions, Energy consumption and Employment.

Tab. 1: Selected variables

Selected variables		
Digitalization		Capital goods investments
Sustainability	Environmental Sustainability	Particulate emissions
	Social Sustainability	Employment

Source: Own Elaboration, 2023

The investments in capital goods have been chosen in order to assess the level of investment in Industry 4.0 technologies since machinery and tools used for production, can be classified as tangible assets that are referred to as capital goods.

The particulate emissions and Energy consumption have been considered to assess the environmental sustainability since the selected industry is a high-polluting and energy-intensive sector.

Lastly, the employment has been chosen as a proxy for social sustainability to evaluate if the implementation of new technologies has caused an increase of unemployment in the Italian ceramic industrial sector.

5.1 Main Results and Discussion about Environmental Sustainability

The indexes used to assess environmental sustainability, and the possible impact of new technologies, are the level of particulate emissions and energy consumption.

Tab. 2: Emissions and Energy consumptions

Year	Particulate Matter Emissions - gr/m2	Δ %	Total Energy Consumption (thermal+electric) [GJ/ton]	Δ %
2005	2,8		7,3	
2006	2,7	-3,70%	7,3	0,00%
2007	2,7	0,00%	7,0	-4,29%
2008	2,6	-3,85%	6,9	-1,45%
2009	2,3	-13,04%	6,8	-1,47%
2010	1,9	-21,05%	6,4	-6,25%
2011	1,6	-18,75%	6,5	1,54%
2012	1,5	-6,67%	6,8	4,41%
2013	1,6	6,25%	6,8	0,00%
2014	1,3	-23,08%	6,7	-1,49%
2015	1,3	0,00%	6,4	-4,69%
2016	1,3	0,00%	6,5	1,54%
2017	1,4	7,14%	6,5	0,00%
2018	1,3	-7,69%	6,6	1,52%
2019	1,3	0,00%	6,7	1,49%

Source: Confindustria Ceramica 2005-2020)

Table 2 shows that particulate emissions have significantly decreased over time, with the largest declines occurring with the financial crisis (2008-2009) and the speculative crisis on sovereign debt (2011-2012), two of the most significant worldwide crises that Italy has faced in recent years. Given the result showed in Table 2, it is reasonable to assume that the decline in emissions is an indirect consequence of the crisis. A global economic crisis implies a reduction in local and global demand, reducing the level of production, which in turn impacts the level of emissions. A reverse trend can also be observed in the years after the implementation of Industry 4.0 probably due to the resulting increase in productivity.

The same reasoning can be used to explain energy consumption. In this situation, we can see that the contraction and expansion are less pronounced, which may be due to the fact that some plants, regardless of the lower production levels, continue to function in the same way.

The effect that the adoption of new technologies has on environmental sustainability in this particular industry is also intriguing. As previous research showed, new technologies permit a more controllable and optimized production process that can reduce emissions and energy consumption (Ghobakhloo, 2020). On the other hand, new technologies imply a higher level of productivity, so it is interesting to study this trade-off (Ghobakhloo, 2020).

To investigate this trade off, we first correlate the investment in digitalization (measured by the investments in capital goods) and related it to productivity (measured by the millions of square meters of ceramic tiles produced). In the second step, productivity and sustainability measures are correlated.

Tab. 3: Level of productivity and Capital goods investments

Year	Productivity (mln m2)	Δ %	Capital goods investments (mln €)	Δ %
2005	570,01	-	279,50	-
2006	568,58	-0,3%	256,02	-9,2%
2007	559,10	-1,7%	302,46	15,4%
2008	512,53	-9,1%	303,85	0,5%
2009	367,95	-39,3%	220,72	-37,7%
2010	387,43	5,0%	224,04	1,5%
2011	399,73	3,1%	248,20	9,7%
2012	367,22	-8,9%	255,47	2,8%
2013	363,35	-1,1%	224,62	-13,7%
2014	381,68	4,8%	286,22	21,5%
2015	394,82	3,3%	351,33	18,5%
2016	415,99	5,1%	400,39	12,3%
2017	422,49	1,5%	514,92	22,2%
2018	415,52	-1,7%	508,24	-1,3%
2019	400,72	-3,7%	373,14	-36,2%
2020	344,29	-16,4%	202,76	-84,0%

Source: Confindustria Ceramica, 2005-2020

The investments in Industry 4.0 technologies are indicated by the capital goods investments made by Italian businesses engaged in the ceramic industry. Capital goods proxy Industry 4.0 because machinery and tools used for production can be classified as tangible assets that are referred to as capital goods. Specifically, only those investments made after 2015 (the year in which Industry 4.0 began to gain traction in Italy (Baldassarre, 2017) have been counted as investments in Industry 4.0 technologies.

The Pearson correlation between capital goods investment and productivity was calculated in order to determine whether investing in Industry 4.0 technologies raises the productivity of the companies.

If we consider the whole timespan the obtained correlation is equal to 0,074 (p-value = 0,00055). However, the correlation coefficient is very low. In order to focus on Industry 4.0 specifically, the correlation between capital goods investments and productivity after 2015 has been computed. The obtained coefficient raises to 0,923 (p-value 0,042), demonstrating a strong positive correlation.

At this point, in order to verify the above-mentioned trade-off, it is necessary to look into the correlation between productivity and sustainability measures (i.e., emission and energy consumption).

The correlation between productivity and particulate emissions is equal to 0,808 while the correlation between productivity and energy consumption is equal to 0,763 (p-value 1,42202E-12) in both cases.

This demonstrates that, as stated before, an increase in productivity implies an increase in emissions and energy consumption but is important to verify which is the role of technology: We must analyse whether technologies have an impact on the magnitude of the increase in emissions and energy consumption, as supposed by previous research (Birkel, 2019).

Also in this case, correlation analysis between the investment in capital goods/particulate emissions and energy consumption was performed. The obtained correlation between investments and emissions is -0,457 while the correlation between investment in capital goods and energy consumption is equal to -0,349 (p-value 2,03025E-09 in both cases).

This result can be interpreted as follow: an increasing investment in new technologies, used in the production phase, increases productivity with a subsequent rising in emissions and energy usage. However, the growth is achieved with technologies that allow processes optimization and higher control, leading to a disproportional (i.e., a lower) increase as compared to what would be observed without these technologies. These results allow us to confirm that what has been presented by extant work (Lee, 2015; Reis, 2017) can be considered applicable also to the Italian ceramic industry.

The ratio between particle emissions over production and energy consumption over production has been calculated to verify the assumption that the technology reduces, in relation to the level of production, the environmental impact.

To do so, the analysis was conducted by dividing the historical period into the years preceding and following Industry 4.0.

Tab. 4: Calibration of sustainability indicators on production levels

Time interval	Particulate emissions/production	Energy consumption/production
2010-2014	4,16E-09	1,75E-08
2015-2020	3,22E-09	1,60E-08

Source: Own elaboration, 2023

As showed in Table 4 the ratio of particulate emissions over the production is reduced from 4,16E-09 g/m² to 3,22E-09 g/m² while the energy consumption is reduced from 1,75E-08 GJ/ton to 1,60E-08 GJ/ton.

As expected, even though productivity has increased as a result of the adoption of new technologies, we can see that the incidence of this growth has declined thanks to the same technologies that were initially adopted, even though the level of particulate emission and energy consumption has increased in absolute terms.

Lastly, the normalized index (j) has been computed taking into consideration as critical values (x_i) the average values of the last 3 years in the sample, by doing this, we are able to reach a critical value where potential year-specific biases are reduced. The index has been calculated following the formula:

$$j = \frac{x_i - MIN}{MAX - MIN}$$

The obtained values are equal to 0,022 for the particulate emissions and 0,222 for the energy consumption. It is important to notice that in this case, we are talking about negative drivers for environmental sustainability, so the lower the index the better the environmental sustainability performance.

To make the analysis consistent and the result more readable and comparable with the following analysis, we consider a value close to 1 as a positive result, while a value close to 0 as a negative one. As the final index, we need to compute the complementary value equal to 1-j.

The particulate emission index is equal to 0,978 and the index for energy consumption is equal to 0,778. Both indices are quite high, thus revealing a good performance for the environmental sustainability registered by the Italian industries operating in the ceramic field.

5.2 Main Results and Discussion about Social Sustainability

As anticipated, it is also important to investigate how industry 4.0 will affect workers. Indeed, it appears that one possible effect of technology implementation within a company is an increase in the unemployment rate (Birkel, 2019), with ensuing effects mirrored at industry level.

Coherent with the approach employed for sustainability, we investigate this effect by looking into the unemployment rate over 15 years and by concentrating in particular on the influence brought on, particularly by Industry 4.0. Hence focusing only on the period after 2015 (Baldassarre, 2017).

Tab. 5: Employment trend

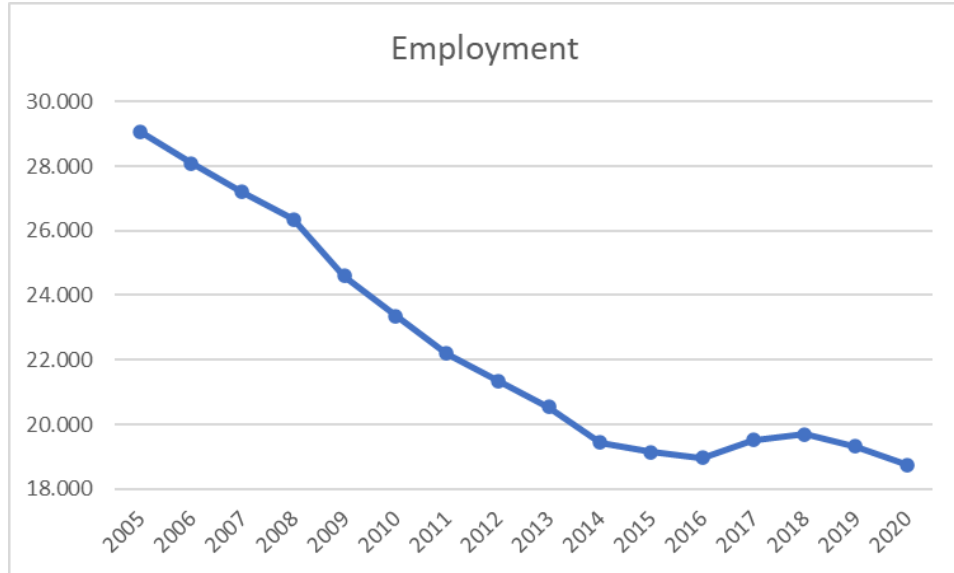
Year	Employment	Δ %
2005	29.084	-
2006	28.093	-3,5%
2007	27.210	-3,2%
2008	26.364	-3,2%
2009	24.595	-7,2%
2010	23.352	-5,3%
2011	22.189	-5,2%
2012	21.355	-3,9%
2013	20.537	-4,0%
2014	19.430	-5,7%
2015	19.143	-1,5%
2016	18.956	-1,0%
2017	19.515	2,9%
2018	19.692	0,9%
2019	19.318	-1,9%
2020	18.747	-3,0%

Source: Confindustria Ceramica, 2005-2020

As we can notice from the data reported in Table 5, the Italian ceramic sector has suffered from a constant decline in the level of employment over the years. Peaks were caused by the effect of the financial crisis and sovereign debt speculative crisis.

An important observation, which can already be made by looking at the data reported in absolute and relative terms, is that the years with an increase in the number of workers are those that follow the emergence of Industry 4.0 technologies.

Fig. 1: Employment trend



Source: Confindustria Ceramica, 2005-2020

Looking at figure 1, we can see this more clearly. Until 2015, a consistent reduction in the number of workers can be observed. From 2015 onwards, the downward trend is less pronounced, and starting from 2016 the trend has reversed, showing an increase in the number of employees.

Again, we computed the Pearson correlation between capital goods investments and the employment rate.

If we take the entire period from 2005 to 2020 into consideration, the correlation we find is equal to -0,367 (p-value 9,0409 E-10).

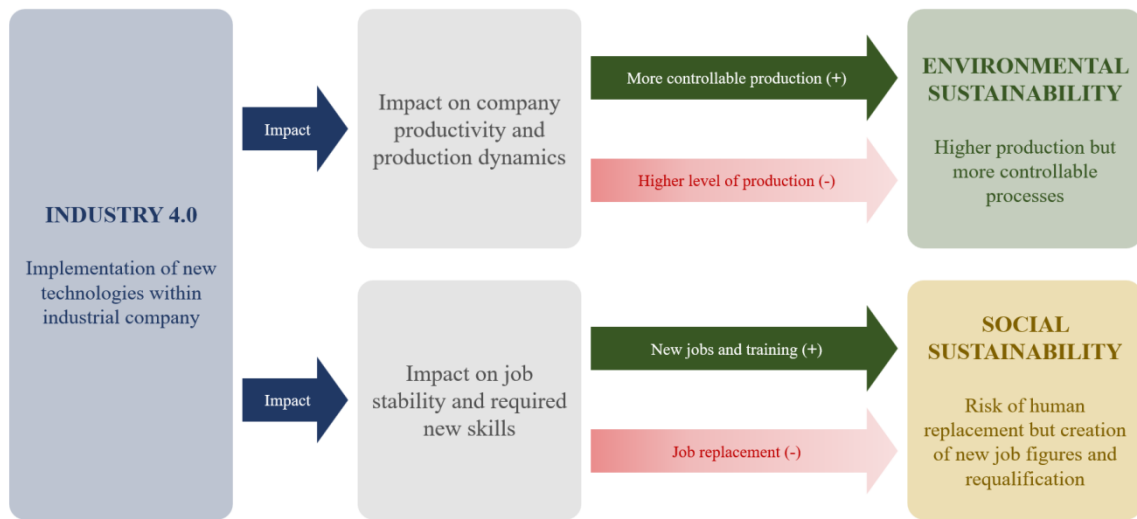
To further examine the effect of Industry 4.0 on the employment rate, it is required to concentrate the analysis on the time after its implementation. For the period 2015 to 2020, the correlation is 0,886 (p-value 0,000204), indicating that Industry 4.0 technologies do not lead to the decline in employment, thus leading us to a radically different conclusion.

Finally, the normalized index has been computed considering employment as a driver for social sustainability. In this case, the index has a value equal to 0,05, demonstrating a bad performance, and thus, showing contradictory evidence. But there are no pieces of evidence that this poor result can be imputable to digital transformation, rather, it could be ascribed to the decrease in the number of companies in the ceramic industry over the time interval analysed (ConfindustriaCeramica, 2020).

5.3 Framework about Industry 4.0 Impact on Sustainability

This set of results that were presented and highlighted within the above can be summarized graphically by following the framework proposed below:

Fig. 2: Industry 4.0 impact on Social and Environmental sustainability framework



Source: Own elaboration, 2023

The diagram provides a clear illustration of the major impacts that the implementation of new technologies can have on environmental and social sustainability within the industry. With the introduction of Industry 4.0, productivity is significantly improved; in fact, new technologies make it possible to reduce time, make processes leaner and faster, reduce the rate of non-compliant products, and make the company more competitive on the market (Ibarra, 2018; Rüßmann, 2015; Lee, 2015; Reis, 2017).

These elements increase the amount of goods produced and consequently cause an increase in the level of energy consumption and emissions.

At the same time, because of the same technologies, benefits are generated. As previous research showed, new technologies allow a more controllable and optimized production process that can reduce emissions and energy consumption (Ghobakhloo, 2020). This generates a trade-off between increased emissions related to increased productivity and a more optimized and controllable process that allows a reduction of the same emissions.

Through the empirical analysis it was verified that, in the context of the Italian ceramic industry, the positive effect generated is more than proportional than the negative effect. This leads us to conclude that thanks to new technologies it is possible to achieve a better environmental performance in relative terms.

The same can be stated for social sustainability. While new technologies may replace human labour, they also create new job opportunities and transform existing jobs. Workers can be trained to adapt to new technologies, allowing them to continue working and even be complemented by new workers if needed.

Even in this case, through the empirical analysis it was verified that, in the context of the Italian ceramic industry, the positive effect generated is more than proportional to the negative effect, since 2015 there has been a reversal leading to an increase in the number of people employed in the sector even though the overall trend over the entire time interval has been negative.

7. Conclusions

Industry 4.0-related cutting-edge technology implementation has changed how businesses operate. By analysing businesses in the Italian ceramic sector, this paper seeks to analyse and clarify the effects that this phenomenon has on both people and the environment.

It is now possible to conclude that the introduction and integration of new technology within the Italian ceramic sector can have both favourable and unfavourable effects, as anticipated from the available literature (Ibarra, 2018; Rüßmann, 2015; Lee, 2015; Reis, 2017; Ghobakhloo, 2020; Birkel, 2019). The study is conducted by applying a quantitative methodology based on both longitudinal analysis and normalized indices calculations.

We observed that businesses can boost their productivity as new technologies become available. While there is no doubt that this is advantageous to the company, there is also a risk that it could harm the environment.

In fact, higher productivity also results in higher particle emissions and higher energy requirements for production, but it's important to stress that Industry 4.0 has positive consequences as well.

Better process control, production optimization, and waste reduction are also made possible by new technologies.

Due to this, it was determined to look at how the same technology can potentially affect the degree of the increase in emissions and energy consumption linked with better productivity, either positively or negatively.

The investigation's findings led us to the conclusion that using Industry 4.0 technology will improve the relationship between emissions/energy use and production levels.

Therefore, it is crucial to emphasize that even while productivity has increased, the measured rise in particulate emissions and energy consumption is lower than what would have been achieved without the optimizations made possible by Industry 4.0, producing a meaningful positive effect.

Furthermore, if we make a comparison with historical data, the computed normalized index shows that the Italian ceramic industry is now performing well enough in terms of environmental sustainability.

For what concern social sustainability, it was possible to observe that the scenario studied suggests no negative impact of Industry 4.0 technologies on employment levels.

It is true that there is a bad correlation between digitization and employment, if we consider the entire time period, but if we limit our analysis to Industry 4.0-related technologies the trend is reversible and indicates an increase in the number of workers.

In the situation under discussion, it is plausible to draw the conclusion, in the case under analysis, that Industry 4.0 technologies do not negatively affect employment levels, contradicting widespread beliefs and assumptions expressed in some previous studies.

Lastly, the evaluation of social sustainability obtained through the computation of the normalized index yields a poor result, which indicates that the performance recorded by the Italian ceramic industry regarding the employability rate is quite low, compared to the historical series. However, it is crucial to understand that the empirical analysis does not reveal any direct connection between this poor result and Industry 4.0 technologies.

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Research Impact Management: a strategic approach to promote innovation

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Abstract

Framing of the research. *Entrepreneurial universities are complex networks of scientific and industrial collaborations. The research initiatives, such as research projects or infrastructures, undertaken within entrepreneurial universities are valuable for both the academic community and the territory where they take place because of the impact they are expected to generate.*

Purpose of the paper. *The aim of the paper is to fill the existing gap in entrepreneurial university literature concerning the impact generation process proposing a novel Research Impact Management (RIM) approach to guide Principal Investigators in their strategic decisions.*

Methodology. *The paper represents a theoretical contribution.*

Results. *The work proposes a novel RIM approach to support PIs in the process of managing innovative initiatives toward impact generation. In the RIM approach, first we present the Research Impact Framework to guide PIs acting as Explorative Entrepreneurs in a strategic perspective aimed at maximizing the impact triggered; then we propose a comprehensive Research Impact Report including the KPI's to be monitored during the impact management process as well as at the end of the research project to reach a final measure of the impact created by the project itself.*

Research limitations. *The theoretical approach proposed needs to be strengthened and this may be accomplished by conducting case study research.*

Managerial implications. *PIs who apply our framework would adopt a strategic orientation toward the generation of impact.*

Originality of the paper. *The paper sheds new light on the importance of the final impact generated by research initiatives, focusing on the crucial role played by PIs and promoting the adoption of a structured strategic approach to maximize the final impact of research.*

Key words: *research evaluation, impact reporting, entrepreneurial university, principal investigator, social impact.*

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1. Introduction

In a knowledge-based economy, that is global and interlinked, there is a strong need to create and maintain networks of knowledge, to combine knowledge theory and business practice, to strengthen the cooperation between two different environments, research and business, in order to obtain economic and social outputs, outcomes and impacts.

An entrepreneurial university is a widely accepted institution that can promote such a cooperation in the network of knowledge. It can contribute to the development of heterogeneous networks, including diverse actors, different disciplinary backgrounds or even industrial sectors. It can facilitate the exchange of tacit knowledge, the formation of “communities of practice” and the greater access to advanced human resources (Lave and Wenger, 1991). This results in the tendency among universities to be increasingly engaged in collaborations with industry and in the technology transfer process (D’este and Perkmann, 2011).

The research initiatives, such as research projects or infrastructures, undertaken within entrepreneurial universities are valuable for both the academic community and the territory where they take place because of the impact they are expected to generate.

Policy makers and local communities have therefore increasingly growing expectations on research projects and infrastructures. Research infrastructures, in particular, are essential components not only of scientific and technological progress but generally of the socio-economic wealth of the territory where they are located (ESFRI, 2008, 2010; European Commission, 2010; Technopolis, 2011).

These initiatives are embedded in a dynamic and inclusive network, and it is worthy to inform all stakeholders, through a socio-economic impact measurement, about the shared value creation (Porter and Kramer, 2011), not just about its financial effects.

We refer to impact as broad term that considers the persistence in time and scope of the short-term results. The undeniable importance of impact generation within the scope of the above-mentioned research initiatives raises the need for a comprehensive model to shed light on the impact generation process. We aim to fill this gap in the entrepreneurial university literature proposing a novel Research Impact Management (RIM) approach.

Principal Investigators (PIs) play a strategic role in this direction. PIs are academic individuals, such as professors, researchers who work in the pure, intellectual world of science and do not deal with customers’ everyday needs. PIs know the technology extremely well, but they often have little experience on the commercial and entrepreneurial exploitation of their research initiatives to promote innovation.

To reach entrepreneurial university’s objectives, it is important for PIs to develop an entrepreneurial orientation. Such a mindset would enable them to capitalize intellectual property developed in universities, addressing their activities to the creation of spin-off companies, thus changing their administrator state of mind, merely concentrated on husbanding resources and reducing risks. Their actions should be considered a direct way of transferring scientific knowledge to markets and contributing to economic growth forming and attracting new firms, promoting high technology or R&D-based technological activity and regenerating local economy and commercial return on investment. The translation of research findings into a commercial product or service requires capabilities and skills different from scientific. Beyond the ability to do research leading to breakthroughs, PIs need to be able to recognize and promote the market potential of such breakthroughs.

Their specific function is to coordinate the network of knowledge in order to spur innovation and entrepreneurship. Actually, they are responsible for the scientific or technical direction of research activities engaging various stakeholders.

Generally, two aspects of their activity have been taken into consideration: PIs as scientific leaders and PIs as project managers. As scientists, they are involved in anticipating the next stage of scientific development and in shaping new scientific directions. On the other hand, as project

managers, they manage diverse teams and organizations, guiding them through planned milestones to achieve specific goals.

Starting from these considerations, we deal with PIs as Explorative Entrepreneurs (Romano *et al.*, 2014), able to combine knowledge theory and business practice, to coordinate the network of knowledge in order to manage innovative and entrepreneurial initiatives.

The final goal of such research activities is however to generate an impact on society at large which goes beyond the production of scientific knowledge. The accomplishment of this goal depends on the scientific competences of the PIs and the researchers but, above all, on their capability to make innovations attractive for the market, to influence the broader culture of entrepreneurship in the context they work, to facilitate the creation of new innovative firms.

In particular, the final impact triggered depends on a complex impact management process that includes impact forecast (often required by funding bodies), impact generation and impact reporting (Molas-Gallart *et al.*, 2000; Smit *et al.*, 2021). The PI is responsible for the impact generated and should therefore be provided with the right mindset and the right tools to face the above-mentioned process.

The aim of this work is to propose a novel Research Impact Management (RIM) approach to support PIs in the process of manage innovative initiatives toward impact generation.

In this perspective PIs should undergo a transition from a purely scientific mindset towards an open explorative mindset. In the RIM approach, first we present the Research Impact Framework to guide PIs' decision-making acting as Explorative Entrepreneurs in a strategic perspective aimed at maximizing the impact triggered; then we propose a comprehensive Research Impact Report including the KPI's to be monitored during the impact management process as well as at the end of the research project to reach a final measure of the impact created by the project itself. The paper presents the Research Impact Framework and the Research Impact Report as pillars of the Research Impact Management approach.

2. Entrepreneurial Universities and the network of knowledge

The model of entrepreneurial university has evolved coherently with the growing recognition of knowledge as an intangible factor determining economic growth and the related rising of new conceptions of knowledge production and innovation process.

Philosophers such as Ryle (1949) and Polanyi (1958) were among the earliest scholars who expressed an interest in knowledge. Since then, the number of studies on knowledge have been growing rapidly. In particular, in 1974 Collins underlined the importance for high-tech firms to develop strong connections with academic labs in order to master new knowledge. In accordance with this concept, Cohen and Levinthal (1989) focused on the circulation of knowledge, developing the notion of absorptive capacity, that is the ability of organizations to learn, assimilate and use knowledge developed elsewhere through process that involves substantial investments, especially of intangible nature (see also Schillaci *et al.* 2012, 2013; Nicotra *et al.*, 2014).

In the same period, Rosenberg (1974) portrayed the innovation process as a set of activities linked one another through complex feedback loops (chain linked model). Innovation was seen as a trial-error process, the result of an interactive and collective process within a set of connections among people and institutions which evolve over time (Kline and Rosenberg, 1986). This progressively gave rise to a "network model of innovation" with the notion of "techno-economic networks" (Callon, 1992) or more recently "distributed innovation process" (Coombs *et al.*, 2003) or "open innovation" (Chesbrough, 2003).

The growth of interest in the connections leading to new knowledge production and the importance given to contamination and cross fertilization among different institutions in the innovation process, was at the bases of the new conceptual framework proposed by Freeman (1987), Lundvall (1992), Nelson (1993) and Edquist (1997) where universities not only produce new knowledge, but they do it with a social and economic perspective in mind. Specifically,

Gibbons *et al.* (1994) elaborated the notion of “mode 2” knowledge production based on the concept that the drivers of new knowledge efforts are the societal and economic problems, and that university is one of the most important knowledge producing agents.

In 1997, Etzkowitz and Leydesdorff proposed their view of a triple helix of industry, government, and university. According to the authors, the advent of the third mission represent the “second academic revolution” (being the first related to the additional role of research in a “teaching” based university - see Jencks and Riesman, 1968). The result is the emergence of the “entrepreneurial university” which combines teaching, research and contributing to the economy particularly in the local region (Etzkowitz, 1997, Etzkowitz *et al.*, 2000; Clark, 1998, Schillaci and Nicotra, 2010). The engagement of universities in third mission activities started with the establishment of real industry-university collaborations and the creation of joint research projects between public and private sectors. In particular, the creation of Technology Transfer Offices (TTOs) in universities as well as the implementation of patent policies were led by the need for to regulate the exploitation of their intellectual property (see Slaughter and Leslie, 1997, Geuna, 2001; Nowotny *et al.*, 2003, Romano *et al.*, 2014). In order to valorize the results of their research, given the reluctance of existing firms to invest, universities also began to promote the creation of academic spin-off firms through the establishment of academic incubators.

Therefore, an Entrepreneurial University develops a complex system of relationships, a network of knowledge with other research centers, institutions and companies that share the mission of enhancing the competitiveness of the region through research, innovation, technology transfer and dissemination of a culture of quality and specialized training. The role of Entrepreneurial University is to establish a network of knowledge consisting in a number of positions or nodes, occupied by individuals, firms, business units, other universities, governments, customers, or other actors, and it is an organizational response to the complexity or uncertainty of technology and market (Tidd *et al.*, 2005). The network of knowledge should exist at multiple levels, including sector, regional, national, or global with a flexible structure rather than clear hierarchy and boundaries; it should be dynamic and orient to long term collaboration (Tidd *et al.*, 2005). The network is made up of various organizations, which have a core with both weak and strong ties, formal and informal links. Entrepreneurial University acts as an intermediary or organizer to exchange information and solve the interface boundaries between different organizations. Secondly, since the current innovation is full of complexity and uncertainty, and it is almost impossible for any actor to finish innovation independently, each actor in the network has its own core competence and expertise. As a knowledge network, Entrepreneurial University is a learning organization. By learning, new capabilities and assets are identified, acquired, shared among network participants, and continuously updated to give the network a whole competitive leadership (Rycroft and Kash, 2004). Finally, such collaborative R&D activities around Entrepreneurial University are oriented directly to solving problems. Numerous studies have confirmed the vital importance of user-producer linkages, and successful innovations were characterized by developing an understanding of special needs and circumstances of potential future users of new products, process, or service. Since the collaborative R&D fully take the user needs into account at the beginning, the commercialization-oriented innovation can achieve the goals of rapid response to market, sharing R&D costs, reducing risk and uncertainty.

In this context, as explained, an important role is played by PIs that are individuals responsible for the scientific or technical direction of research projects. In Entrepreneurial Universities their activity is not limited to anticipating the next stage of scientific development but also includes managing diverse teams and organizations and so getting a network vision, orienting research towards innovations attractive for the market, facilitating the creation of new innovative firms.

3. PIs as explorative entrepreneurs

A stream of literature has focused on academic PIs roles, responsibilities, and attitude, developing some categorizations. Kidwell (2013), using case studies, finds that effective principal investigators engage in acts of brokering (extrapolating, seeking, aligning and anticipating) that help them achieve their research and commercialization goals. Casati and Genet (2014) underline their function as scientific entrepreneurs, managing the interplay between science policies and scientific agendas. According to Cunningham *et al.* (2014), the role of PI brings along professional prestige and new responsibilities beyond research leadership to research management. However, often some inhibiting factors (political and environmental, institutional and project based) are experienced by PIs in developing such a role. O’Kane *et al.* (2013) identify four categories of PIs: research designer, research adapter, research supporter, and research pursuer. Such categories emerge from PIs’ posture (reactive/proactive) and degree of conformance. More proactive PIs utilising non-conformance strategies shape new research trajectories, while more reactive PIs using conformance strategies predominantly pursue and deepen existing trajectories. Boehm and Hogan (2014), through case studies, suggest that PIs are better placed than Technology Transfer Office (TTO) managers to act as boundary spanners in bridging the gap between science and industry. Baglieri and Lorenzoni (2014), building upon five illustrative case histories, propose that scientist-user PIs exhibit superior capabilities in turning generic technology into several selected market applications, with no negative effects on their academic role. Romano *et al.* (2016) presented a framework of Principal Investigators (PI) categorization. It is a matrix where “Visioning” (Long term vs. Short term orientation) and “Opportunity recognition” (Science vs. business) are the orthogonal dimensions used to delineate four types of PIs: “Science focused”, “Collaborative”, “Industry focused”, “Explorative entrepreneurs”.

PIs who act as “Explorative Entrepreneurs” deploy their activities both within the scientific community and in interaction with policy makers, firms, or the society at large. In interacting with non-academic actors, they move beyond their scientific trajectories. Their science is “made” across cultural, occupational, and geographic boundaries, with stakeholders’ interdependence. They assume their role as embedded in the broader social systems (Weick, 1979). Moreover, they are able to develop an entrepreneurial orientation that capitalizes intellectual property developed in their organizations by creating spin-off companies. So, they change their “administrator” state of mind, whose object is to husband resources and reduce risks, into an entrepreneurial mindset.

This shift requires PIs to transcend their pure scientific role and overcome institutional and organizational boundaries to combine technologies and markets, promoting innovation by managing knowledge communities and developing entrepreneurship. Universities can stimulate PIs to act as “Explorative entrepreneurs” by training them not only on how to perform science, but also on how to adopt an entrepreneurial approach as a result of as a learning process driven by organizations.

Del Giudice *et al.* (2016) dealt with the performance of a PI acting as an explorative entrepreneur. In their contribution, authors defined some key performance indicators related to PIs’ entrepreneurial orientation, analyzed through four macro items: 1. Networking and resource acquired, 2. Innovations realized, 3. Technology transfer activities, 4. New spin-offs and start-ups. First of all, they argue that the entrepreneurial performance of PIs can be expressed as the outcome in terms of built and shaped networks. In the literature there is strong consensus that collaboration between the original researcher and stakeholders are of great importance in the development phase and afterwards (Del Giudice and Maggioni 2014; Jolly 1997; Roberts 2000; Thorburn 2000; Zucker *et al.* 1998, 2002). Industry partners can even become loyal to individual PIs and continue the working relationship. An entrepreneurially oriented PI is able to coordinate these relationships and act as a guardian for evaluating and reconciling mutual interests. The PI can be “a jack of all trades”, taking on the roles of project manager, negotiator, and resource acquirer. A PI, rather than a technology transfer manager as proposed by several authors (Siegel *et al.* 2004; Wright *et al.* 2007), is best placed to bridge the gap between industry and science. It has been empirically validated that commercialization of new knowledge is likely to occur when scientists are aware of

the individual benefits of commercialization, when they are able to identify the economic value of new knowledge, and when they have access to external bodies with resources and market knowledge to invest in the new knowledge (O’Gorman *et al.* 2008).

Therefore, the current work fits in the middle between the literature that categorizes PIs and defines their characteristics as explorative entrepreneurs and the literature that defines and measures the performance of such PIs in terms of final impact generated and strategic orientation adopted during the impact management process.

Below we propose a framework as part of the Research Impact Management approach of a PI acting as explorative entrepreneur in an entrepreneurial university to promote innovation.

4. Developing a Research Impact Framework

The literature on PIs has not developed yet tools able to strengthen PIs’ entrepreneurial and managerial dimensions to enhance PIs acting as Explorative Entrepreneurs in managing knowledge within scientific and industrial networks of collaborations.

PIs as Explorative Entrepreneurs deploy their initiatives both within the scientific community and also in interaction with policy makers, firms, or the society at large. Their scientific projects are implemented across cultural, professional, and geographic boundaries, with stakeholders’ interdependence.

The literature on project management refers to techniques for planning, scheduling, and controlling large projects in an evolutionary rather than revolutionary way. Such literature has their roots in well-established procedures, such as flow diagrams, Gantt charts, Line-of-Balance technique, and milestone method, PERT and CPM diagrams.

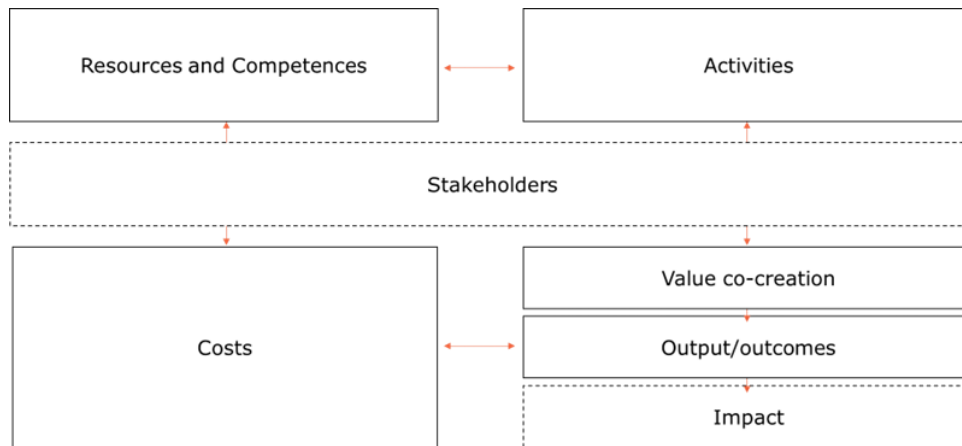
Our contribution is far from project management’ operational models and it is positioned at a strategic level. Our framework indicates a path to follow for PIs in making their strategic decisions, bearing in mind their final goal: promoting innovation and generating a broad impact.

To develop our Research Impact Framework, we draw on business model literature. In recent years business model innovation has become an important tool for organizations to rethink their value creation process and identify new ways of creating value for their customers and for themselves (e.g. Amit and Zott, 2012; Kaplan, 2012, Simons *et al.*, 2011, Kaplan, 2012; Johnson, 2010; Magretta, 2012; Mullins and Komisar, 2009; Rumelt, 2011). The Business Model Canvas proposed by Osterwalder and Pigneur (2010) is a strategic management and entrepreneurial tool to describe, design, challenge, invent and pivot business models. The visual canvas describes the business model through nine basic business elements which covers the four core areas of a business: customers, offer, infrastructure, and financial viability.

In general, the discussion on business models takes place at the firm-level (Siggelkow, 2001; Tikkanen *et al.*, 2005; Hedman and Kalling, 2003). Some scholars have also proposed that the analysis of business models should not be restricted to a firm -or a business unit- level only (Slywotsky *et al.*, 1998; Magretta, 2002; Chesbrough and Rosenbloom, 2002). Building on their arguments, we propose a business model for research project developed by PIs in an Entrepreneurial University. Our framework applies the logic of a business model to impact management, comparatively evaluating project costs (publicly funded) along with project results in terms of assessing (ex-ante), measuring (day by day) and controlling (ex post) outputs, outcomes and impacts.

The Research Impact Framework represents how the research project co-creates value for all the stakeholders. Understanding and rethinking the research project as a whole can better orient PIs’ actions, it allows to capture opportunities to be exploited and enable to easily identify non-productive activities to be eliminated. Impact management adopting the Research Impact Framework leads to greater and more significant results allowing to plan, monitor and report outputs, outcomes and impacts.

Fig. 1: Research Impact Framework



Source: authors' own elaboration

A Research Impact Framework is a simplified representation of the research logic that can be understood as a common language in the research team. Through such a visual representation, the complexity of a research project can be handled successfully (Rode 2000), helping identify and understand the relevant elements in a specific domain and the relationships between them (Morecroft 1994; Ushold and King 1995). Therefore, as for the business model, a Research Impact Framework helps capture, visualize and communicate the logic of the project. Once a project is mapped and understood within such a framework, the foundations to reinforce PI's proactive capacities to respond to external pressures have been created. Moreover, it aligns research and economic value, thus allowing to reach the objectives of an entrepreneurial university promoting innovation.

First of all, it is important for PIs to define the stakeholders of the project they are coordinating. For each stakeholder, to specify the Value to be co-created with them. The connection between Stakeholders and Impacts is given from the Output/Outcomes, in the sense of results of the value co-creation. Finally, going beyond Output/Outcomes, measuring the Impact. In addition, to obtain output/outcomes, it is important for PIs to define the Activities of the project they are coordinating. For each stakeholder, to specify the Resources to be co-created with them and the costs.

The remaining of the section analyses the different building blocks of the proposed model.

Stakeholders

The orientation of the PI in an entrepreneurial university should give the chance to undertake projects of territorial strategic development, where the main stakeholders are companies and institutional actors. Focusing on stakeholders is essential to any business project and the same goes for research projects. In the matter of fact, stakeholders are those who valorise the research, making it a real answer to technological, social and economic needs. When analysing stakeholders, it is essential to keep in mind that different stakeholders may require different value proposals and relationships. For a research project, the major stakeholders could be Industry and Government. The orientation typical of entrepreneurial universities allows the organization to intervene at all stages of the innovation process, expanding its opportunity to undertake projects of territorial strategic development, where the main actors are companies and institutional actors. On the one hand, Industry needs to access and use the knowledge asset and skills developed within the University, above all in a highly competitive production system. On the other hand, also from the Government point of view, research can generate social development and direct/indirect economic returns.

To create and maintain connection with the stakeholders is an important issue both for the PI itself and for the research team with an intense networking activity. The liaison office of the university can provide support in this direction. Moreover, *ad hoc* ICT platforms can be a strategic instrument to maintain direct connections with the industrial and institutional world.

Value co-creation

Value co-creation can be defined as the vision of the benefits to create for and with the stakeholders (Bagchi and Tulske 2000). It is an overall view of the project that represent value for each stakeholder. Value co-creation is essential to every Project Network Model. It can be defined as the statements of benefits that are delivered by the project to each stakeholder (Bagchi and Tulske 2000). The element “value co-creation” is an overall view of the project that represents value for a specific stakeholder. It describes the way the research project differentiates itself from the actual “state of art” and how it contributes to scientific and economic development. The process of co-creating value results in contributing to academic worldwide advancement, wealth co-creation and economic prosperity, supporting firm’s competitive advantage.

Focusing on the right side of the Research Impact Framework , we can find elements able to influence output and outcomes as well as impact: Activities, Resources and Competences, Costs.

Activities

First of all, it is necessary to develop a sequential activity plan of the research project and to understand what can be run in parallel. Activities are at the heart of what a project realizes. They are the actions the research team performs to create value. When done right, good planning will typically ensure the execution phase of a project runs very smoothly, barring any unforeseen issues. Clearly defining the work and breaking it into small work units, developing a sequential key activity plan (step 1, step 2, etc.) and understanding what can be run in parallel are crucial factors. Once these work units are defined, resources can easily be assigned based on availability and skill sets.

Networking activity play a central role providing access to resources that the research team does not own. Network can provide access to information, markets, technology, knowledge and other important resources (Hitt *et al.*, 2001). The PI of a research project has to consolidate the network, the key partners of the project. Networks play a central role primarily because they provide access to resources that the research team does not own, enhancing, like for a firm, its competitive position. Network can provide access to information, markets, technology, knowledge and other important resources (Hitt *et al.*, 2001).

Resources and Competences

Resources and Competences represent the most important assets for a PI’s research project. They go along with the activities a PI has to focus on when implementing a project. Key resources represent the most important asset to a research project, and they can be segmented in four different types: human, physical, intellectual, and financial. Grant (1991), referring to firms, distinguishes between tangible and intangible assets and people-based skills. Tangible resources include plants, equipment and cash reserves. Intangible resources include patents, copyrights, reputation, brands and trade secrets. Human resources are the people needed to create value with tangible and intangible resources. Reflecting on their core capabilities helps PI to streamline its micro-organization and build the research project competitive advantages.

Specifically, ICT resources can have a very strong influence on the ways activities are organized: the use of databases for managing customer and partner related information, the web site of the project, a reserved area to monitor the state of the research project. ICT helps the research group to provide stakeholders with ever richer information (Evans and Wurster 1997) and it is also a way of rapidly extracting feedback and information from those users that may be able to improve products and innovation.

Costs

As in a business model, even in the Research Impact Framework, while evaluating project impacts, PIs need to control and access project costs. Costs represent things such as key resources that need to be acquired, costs of performing key activities and working with key partners. PI needs to measures all the costs the team incurs in creating, marketing and delivering value.

Output and outcomes

Expected results in the short/mid-term should be defined in order to orient PI's activities. They could be related to publications, patents, spin-offs, commercialization of patents, events and other project related items. The outcomes could also be represented by income derived by services and after-sale services offered to companies or to other research centers thanks to the developed project. Income may also arise from selling or licensing property rights. Therefore, there are outright sales, lease or rent, service or usage fees, subscription fees, licensing, brokerage fees. The revenue streams stakeholders can capture from the project are pivotal to its long-term survival.

These short-term results of the research initiatives need to be monitored to keep track of the advances made toward the final impact expected. Monitoring the work in progress is even more important when a strategic explorative perspective is adopted by PIs because a full knowledge of the state of the art helps them strategically plan future actions to enhance the overall performance.

The performance in terms of networking and resource acquired can be measured with some indicators, such as numbers of relations activated with industry for projects, both financed and not, new research projects presented to a funding agency (competitive tenders), new research projects financed (competitive calls); contributions received for research; agreements for research and consultancy financed by third parties, not funding agency. The entrepreneurship performance of PIs is also strictly linked to invention and innovation. The pattern of entrepreneurship goes back to the 1930s, when Schumpeter (1934) was the first to try to show the relationship between entrepreneurs and innovators. Key indicators of PIs' entrepreneurial performance related to innovation could be the number of invention disclosures, patent applications, patents obtained, patents currently active. In addition, PIs are required to show an interest in transferring and commercializing knowledge.

Key indicators for PIs' entrepreneurial performance related to technology transfer activities. The term "technology transfer" describes the process through which concepts and ideas developed in scientific environments are introduced and exploited in the marketplace (Wahab *et al.*, 2012; Rogers *et al.*, 2001). This aspect can be measured using the following indicators: the number of confidentiality agreements, the number of new license agreements, number of licenses active at the present, earnings from licenses, technology transfer agreements, earnings from technology transfer agreements, material transfer agreements (MTA). Finally, aptitude for entrepreneurship could be measured in terms of the start-ups created both by the PI and by his team. Therefore, the entrepreneurial aptitude of a PI could also be quantified in terms of how he facilitates the entrepreneurial orientation of the team. measured as new business ideas generated, number of ideas that turn into business plans, number of new academic spin-offs created, academic spin-offs active at the present, academic spin-offs active, with university investment, academic spin-offs active, with company investment, academic spin-offs active, with venture capitalist investment.

Other output concern the exchange of information and ideas among individuals taking part in the project. This aspect can be measured by tracking the meetings held within the work packages and among the different work packages as well as the meetings with strategic partners and other stakeholders. This implies to measure what are called organizational and social capital. Concerning human capital involved in the research activity, it is appropriate to periodically keep track of new personnel employed, distinguishing between distinguishing between the various professional figures and academic employees.

From a purely academic point of view, it is also necessary to monitor the number of new scientific publications so as to monitor whether and how the initiative is contributing to the production of novel knowledge.

Impact

Impacts are long-term results, and they may not be achievable even during the life cycle of the project. They should be strictly related to value co-creation. The following section will examine in depth the Research Impact Report that we proposed as complementary to the Research Impact Framework within our Research Impact Management approach.

5. Research Impact Report

The Research Impact Management process implies for PIs to adopt the above-described model in addition to following a procedure of Research Impact Report. The final objective is to generate and be able to assess the largest impact possible in the form of new incremental wealth generated by the research project or infrastructure in the area. The incremental wealth can take different forms depending on the impact type and can affect different types of beneficiaries.

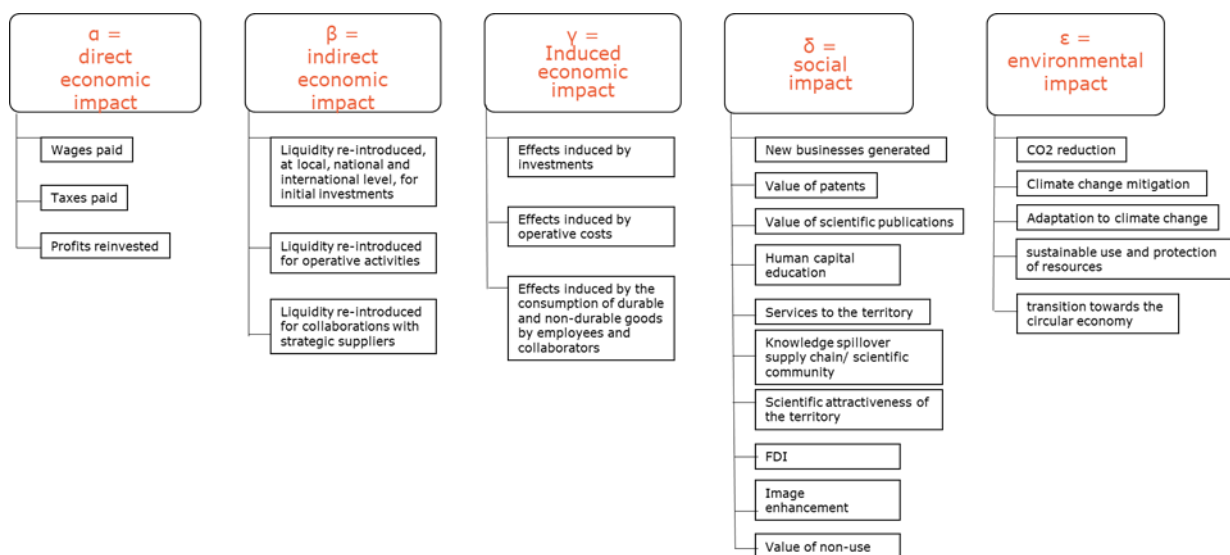
For the reporting procedure, we developed a specific, shared and integrated methodology. Specific because it has been specifically developed to measure the effects of the realisation of the KM3NET-ITALIA infrastructure (PON 2007-2013). Shared because it was shared with INFN for the needs of defining the analysis and data collection framework. Integrated because it combines different approaches: economic approach for direct and indirect impact; macroeconomic approach for the induced impact [Input-Output tables (Leontief, 1966)]; re-adaptation of the methodology by Florio et al (2015) for social and environmental impact; integration of ESG goals for a comprehensive conceptualization and measurement of impact; integration of Monte Carlo methodology for risk assessment.

Reporting impact means to monitor several KPIs concerning the different fields in which the project is able to generate outcomes and, consequently, impact. We propose the following categories of impact to be monitored.

- Direct economic impact, i.e. related to money transferred in the form of wages paid, taxes and profits reinvested.
- Indirect economic impact, generated through the production chain made up of suppliers of goods and business services directly related to the sector analysed.
- Induced economic impact, generated through expenses and consumption induced by the direct and indirect impacts. This consists of the increase in expenditure in the geographical area of reference where the economic activity of suppliers of goods and services whose activity is not directly attributable to the sector analysed increases.
- Social impact, deriving, among other things, from the value of the patents, of spin-offs, scientific publications, the human capital formed, by the knowledge spillover.
- Environmental impact, linked to the benefits concerning some environmental objectives.

For each category, we elaborated a list of KPIs PIs are called to report during the project and at its end. The sum of the individual values provides the total estimate of the impact generated by the infrastructure.

Fig. 2: Research Impact Report



Source: authors' own elaboration

Direct economic impact

The direct impact aims to measure the effect of the research project or infrastructure through the determination of money transferred in the form of wages paid to employees and collaborators, taxes and profits reinvested. In detail, the measures of the direct impact are the following.

- α_1 - Wages paid.
- α_2 - Taxes paid.
- α_3 - Profits reinvested.

Indirect economic impact

The measurement of the indirect impact is linked to the turnover generated by the research project or infrastructure for its suppliers, divided by sector.

This level of impact measures the amount of money transferred in favor of suppliers, both in relation to investments and to operation costs.

The indirect impact is due to the liquidity reintroduced in the territory for activities of local partners and suppliers. In detail, the indirect impact includes the items listed below.

- β_1 - Liquidity re-introduced, at local, national and international level, for initial investments.
- β_2 - Liquidity re-introduced for operative activities.
- β_3 - Liquidity re-introduced for collaborations with strategic suppliers.

Induced economic impact

The study also intends to measure the induced impact, given by two measures. On one hand, the impact on the economic system deriving from the presence of sectoral interdependencies between the various sectors, generating a multiplicative effect that can be measured through the input output tables. On the other hand, the effect on the purchasing power of workers directly connected to the economic activity generated. In detail, the induced impact includes the following effects.

- γ_1 - Effects induced by investments.
- γ_2 - Effects induced by operative costs.
- γ_3 - Effects induced by the consumption of durable and non-durable goods by employees and collaborators.

Social impact

The project is also able to generate a social impact to measure in financial terms. The social impact in detail is below represented.

- δ_1 - New businesses generated by the infrastructure or project. New businesses have already been created and others will be created both locally and nationally to take advantage of the opportunities offered by the research project.
- δ_2 - Value of patents. Technological innovation and research and development activities play a leading role in economics. They are strategic tools for international competition: on one hand, they are decisive for the continuous improvement of more traditional products, on the other, the main source for new products and services. It is important to bring out the economic value generated by the patent activity, which allows a knowledge spillover from which companies and the whole regional and national territory benefit from the increased competitiveness on the market.
- δ_3 - Value of scientific publications. Among the benefits of a research project, there is the possibility for scientists and researchers to access new data, process it and contribute to the creation of new knowledge producing a scientific output, such as a publication in a journal or a monograph.
- δ_4 - Human capital education. The scientific, technical (technicians and engineers), administrative and support staff as well as the PhD students, postdoc researchers, young academics and other short-term users who take part in the project, enjoy training in terms of new knowledge and experience acquired.
- δ_5 - Services to the territory. The infrastructure provides services that the territory enjoys free of

charge. An example may be the construction of infrastructures beneficial for the territory. However, some benefits in the long run are also expected to derive from the initiatives promoted within the project and aimed at supporting the culture of ethics and legality, the culture of equal opportunities, the culture of disability and social inclusion, the prevention and protection of health.

- δ6 - Knowledge spillover in the supply chain. The technology suppliers involved in the design, construction, and operation of a research infrastructure, can benefit from working with/for a research infrastructure. The companies involved in the supply chain face the challenge of providing non-commercial industrial solutions for a series of complex technological problems. This gives companies the opportunity to collaborate with the scientific and technical staff and to acquire new technological knowledge and skills. The benefit of suppliers' learning-by-doing can produce different kind of developments, ranging from improvements to existing equipment to the implementation of processes for the production of new tools finding application in other sectors of science and industry.
- δ7 - Knowledge spillover in the scientific community. Research projects produce significant knowledge also for the scientific community of reference, especially in relation to free access to data.
- δ7 - Scientific attractiveness of the territory. The territory concerned enjoys a flow of scientists interested in the research facilities and of outreach activities for schoolchildren, students, congress initiates that have an impact on expenses of accommodation, catering, transport. Some measures in this field may be: public engagement initiatives and visitors attraction to spread scientific awareness, as well as promotional initiatives to arouse the curiosity of the new generations toward the study of certain disciplines (e.g. STEM disciplines).
- δ8 - Foreign direct investment (FDI). Thanks to the increase in attractiveness of the territory in which the project is carried out or the infrastructure is built infrastructure is located and above all to the supplies needs, an increase in greenfield-type foreign direct investment flows (FDI) is estimated.
- δ9 - Image enhancement. The image of the university and of promoters is strengthened by the project itself both nationally and internationally, with effects on the attractiveness of EU and non-EU funds.
- δ10 - Value of non-use. A further impact on social well-being is related to its discovery potential. The discovery itself, in addition to the value of publications and patents, has an intrinsic social value, and can bring about a number of new improvements in human well-being defined as the "benefits of non-use".

Environnemental impact

- ε 1 - Impacts on environmental objectives. Depending on the project, it is possible to generate an environmental impact to be measured in economic terms, for example the reduction of CO₂. Other measures of environmental impact, as also evidence by EU are: climate change mitigation; adaptation to climate change; sustainable use and protection of water and marine resources; transition towards the circular economy, also with reference to waste reduction and recycling; prevention and reduction of air, water or soil pollution; protection and restoration of biodiversity and ecosystems.

6. Conclusion

The paper provides directions for the process of Impact Management in research projects.

We start from examining the role of PIs who guide the project and are responsible for maximizing the final impact generated by it. In particular, the role of PIs as Explorative Entrepreneurs in Entrepreneurial Universities has been detected. Such a role has been defined as the

ability of PIs to act strengthening the cooperation between two different environments, science and industry.

The paper presents a novel Research Impact Management approach for PIs to strengthen their performance as Explorative Entrepreneurs. It includes a Research Impact Framework and a Research Impact Report. The Research Impact Framework translates and adapts the Business Model concept to PIs' research projects.

Encouraging PIs applying this framework to their research projects can be a useful way to promote a more strategic development as well as to encourage PIs adopt a strategic orientation toward the generation of impact. The framework distinguishes between output/outcomes and impact. While the formers are periodically monitored to keep track of the state of the art, the impact is the final goal of such research initiatives and requires a detailed reporting scheme, which is the second component of our RIM. It includes a comprehensive checklist of KPIs, some of which result from the periodical monitoring of output and outcomes and concern the different categories of impact identified: direct economic impact, indirect economic impact, induced economic impact, social impact, environmental impact. Future research could be addressed to test on field the efficacy of the framework presented in the paper.

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Digital Entrepreneurial Ecosystems: an empirical contribution using SMAA

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Abstract

Framing of the research. *The concept of digital entrepreneurial ecosystem stands at the intersection between the concepts of digital ecosystem and entrepreneurial ecosystem. We start from data summarising the most common digital entrepreneurial pillars emerging in literature to provide robust and reliable measurement of digital entrepreneurial ecosystems.*

Purpose of the paper. *The aim of the paper is to measure and compare digital entrepreneurial ecosystems in European countries in ensuring a productive context for new venture creation.*

Methodology. *We apply Stochastic Multicriteria Acceptability Analysis (SMAA) as a precise, robust, and reliable measurement approach to the Digital Economy and Society Index (DESI) data.*

Results. *The main contribution of this work is the provision of probabilistic ranking that is more robust and reliable than the conventional single ranking derived from composite indices constructed with a single weight vector.*

Research limitations. *We applied SMAA allowing for a limited variation of the weights assigned in the computation of DESI. Allowing for a wider range of variation may provide further relevant insights.*

Managerial implications. *Our work provides relevant managerial implications for policy makers and businesses. The analysis identifies strengths and weaknesses of the different countries thus offering useful guidelines for policy makers aiming to support territorial development and for businesses to identify market opportunities.*

Originality of the paper. *Most indices are computed relying on fixed weights affected by a degree of subjectivity. The application of SMAA methodology allows to consider how a variation in the assigned weights is able to affect the final ranking.*

Key words: *digital entrepreneurial pillars, digital society, entrepreneurship measurement framework, productive entrepreneurship, digital index, SMAA.*

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1. Introduction

The topic of digitalization is growing in popularity in both the political and academic domains and has relevant implications in the field of entrepreneurial ecosystems as well. Indeed, the level of digital maturity of an area may also be determinant for the emergence of new firms.

An entrepreneurial ecosystem can be defined as the combination of territorial actors and factors whose coordination and interaction support entrepreneurship (Corrente *et al.*, 2019; Neck *et al.*, 2004). GEM has followed the progress of nascent entrepreneurship in various countries of the world over the past decade, evidencing that the growth rate and quantity of aspiring entrepreneurs vary between countries which differ for level of economic and technological development (Cunningham & O’Kane, 2017).

The topic of entrepreneurial ecosystems as environment able to support new firms, has been of great interest non only for academics, but also for both governmental and non-governmental entities and institutions, in the attempt to construct reliable and comparable rankings. Some examples are World Bank, the World Economic Forum (WEF), and the Organization for Economic Co-operation and Development (OECD). However, some institutional reports and academic studies also started to focus on digital entrepreneurship systems and technology-based entrepreneurship. Entrepreneurship has indeed undergone a shift triggered by digitalization, the application of digital technologies and infrastructures for a redefinition of economic and social mechanisms. Not only does digitalisation lead to radically reconsider the way value is co-created and distributed at all levels in society, but it also affects all members of society, including present and aspiring entrepreneurs and their initiatives (Autio *et al.*, 2019).

The present work consists in the application of Stochastic Multicriteria Acceptability Analysis (SMAA; Lahdelma *et al.*, 1998) as a precise, robust, and reliable measurement approach, to address the gap in literature concerning a robust measurement of digital entrepreneurial ecosystems at country level. By employing SMAA methodology, we provide a considerable contribution to the evaluation, rating, and comparison of digital entrepreneurial ecosystems. When comparing and evaluating nations, a composite index based on the arithmetic mean of key factors of importance is typically used. The Digital Economy and Society Index (DESI) is taken as reference index for the measurement of digital entrepreneurial ecosystems.

2. Literature review

Roy Clapham first used the term "ecosystem" in 1930 to describe the physical and biological elements of an environment interacting to each other to shape a unit. Moore (1993) has resumed the idea of an ecosystem adopting the lens of business organisation studies. By applying the concept of ecosystem to denote business networks, he argues that the key to compete successfully for businesses is their belonging to an inter-sectoral ecosystem where they may cooperatively co-evolve, as well as gain skills and develop innovation. This analogy evidences similarities between business ecosystems and biological ecosystems existing in nature.

The concept of ecosystem, both in business and in nature, is gradually undergoing a transition from an unorganised collection of components to a more organised and structured system.

Going beyond the idea of an ecosystem in the business environment as a network structure of interacting firms, the concept of has also been applied to the realm of entrepreneurship, referring to the capacity of a certain area to establish a network of actors and infrastructures that foster the birth and development of innovative business projects. That of entrepreneurship ecosystem is then a broad notion that encompasses a variety of different components, thus enlarging the focus traditionally placed by scholars on entrepreneurs as only object of analysis, to investigate the role played by a variety of actors and elements in the entrepreneurial process (Van de Ven, 1993).

As a result, a comprehensive definition of entrepreneurial ecosystem that may have wide applicability is that of "a set of interdependent actors and factors coordinated in a way that enable

productive entrepreneurship". An entrepreneurial ecosystem is therefore finalised to the creation of new value for society at large, while entrepreneurial activity will serve more as an intermediary product of the system. This entrepreneurial activity can take different forms, including innovative start-ups, high-growth start-ups, and entrepreneurial employees.

The presence of some favourable factors such as investors, human resources, culture, infrastructure, institutions, regulatory and fiscal conditions, social and environmental quality, the capacity to generate innovation as well as the availability of real and potential know how can contribute to make an ecosystem a suitable habitat for the development of new businesses. A recent but well-established body of literature have theoretically investigated which factors should be considered as essential for the identification of an entrepreneurial ecosystem.

Van De Ven (1993) provides a detailed description of the industrial infrastructure that enables the establishment of new businesses. This type of infrastructure consists of institutional arrangements to regulate and standardise a newly developed technology, public resource endowments of fundamental scientific knowledge, financing mechanisms, a pool of competent labour, as well as proprietary research and development, manufacturing, marketing, and distribution functions. Cohen (2006) explores the nine primary aspects to be considered essential: they are referred to as the Informal Network, the Formal Network, the University, the Government, the Professional and Support Services, the Capital Services, and the Talent Pool.

Another framework for entrepreneurial ecosystem is that outlined by Isenberg (2011), whose model includes six main relevant factors: a supportive culture, enabling policies and leadership, the availability of dedicated funding, relevant people, venture-friendly markets, and a wide range of institutional and infrastructural supports. Feld (2012) places a strong emphasis on the interaction among ecosystem actors (strong group of entrepreneurs, mentors and advisors, and a robust network) as well as the accessibility to all types of necessary resources (talent, services, finance), while recognising an important supporting background role to government. According to Spigel (2017) an entrepreneurial ecosystem is the result of 11 cultural, social, and material elements that offer resources to make entrepreneurship thrive. These include a supportive culture, a history of entrepreneurship, worker talent, investment capital, networks, mentors and role models, policy and governance, universities, support services, physical infrastructure, and an open market. The above describe body of literature has therefore elaborated various lists of crucial or essential factors characterising an entrepreneurial ecosystem, from a theoretical perspective.

Ács *et al.* (2014) fill a gap in entrepreneurship research by focusing on country-level aspects of the entrepreneurial process and introducing the notion of National Systems of Entrepreneurship as systems of resource allocation where the driving force is represented by individuals pursuing for new business opportunities. The results of this entrepreneurial activity are then regulated based on the institutional characteristics of the country. According to Stam (2015), within an entrepreneurial ecosystem, two main typologies of conditions can be identified: framework conditions and systemic conditions. Framework conditions include elements like demand, informal and formal institutions, culture, and the physical conditions that can either enable or constrain human interaction. Systemic conditions include instead aspects like networks of entrepreneurs, leadership, finance, talent, and knowledge as well as support services.

Shifting the focus from academic definitions toward the conceptualisations made by governmental and non-governmental agencies, according to the OECD, the existence of a legal framework, market conditions, availability and accessibility of financing, the generation and dissemination of knowledge, as well as entrepreneurial competencies and culture all contribute to the development of an entrepreneurial ecosystem. Based on official government statistics sources, the OECD report "Entrepreneurship at glance" published in 2016 provides data at a global level on these entrepreneurial ecosystem factors for 50 countries. Rather than considering a single composite index, the OECD gives a series of indicators, as stated in the report itself: "A defining characteristic of the program is that it does not provide a single composite measure of overall entrepreneurship within an economy. Rather, recognizing its multi-faceted nature, the program revolves around a

suite of indicators of entrepreneurial performance that each provides insights into one or more of these facets.”(OECD 2016, p. 9).

The Global Entrepreneurship Monitor (GEM) for its reports collects data on environmental factors that contribute to the formation of new firms. This data is gathered at a global level with the support of the National Experts Survey (NES) and allows to compare different countries of world. The individual choice to launch a new business is indeed the result of many varying factors and it may have different consequences. Among these factors, the context is undoubtedly stated to be decisive. The entrepreneurial environment or ecosystem plays a crucial role in influencing both the outcome of the decision (whether to start a new business or not) and the subsequent path of the potentially nascent entrepreneur in its attempt to progress from being an aspiring entrepreneur toward being the owner of a well-established firm. Apart from the support of family and friends, this shift is heavily dependent on some elements characterising the context. While it is nevertheless true that some entrepreneurial activities may rise and prosper even under the most tough or improbable conditions, it is undeniable that a supportive environment can inspire ambition and growth, thus facilitating the arduous shift from new to established firms. GEM categorises environmental factors as follows, based on academic literature and on the results of its cross-country study: Entrepreneurial Finance & Ease of Access to Entrepreneurial Finance; Government Policy: Support and Relevance & Taxes and Bureaucracy; Government Entrepreneurial Programs; Entrepreneurial Education at School; Entrepreneurial Education Post-School; Research and Development Transfers; Commercial and Professional Infrastructure; Ease of Entry: Market Dynamics & Burdens and Regulation; Physical Infrastructure; Social and Cultural Norms.

In order to bypass the weighting issue, GEM suggests a variety of indicators rather than a single metric, similar to the OECD's approach. This decision entails giving up a single, comprehensive viewpoint in favour of a variety of signs that are more challenging to explain.

The World Economic Forum (WEF) evaluates the ecosystem competitiveness of 144 economies in its "Global Competitiveness Report", which provides useful insights into the main determinants of competitiveness. WEF suggests a categorisation into 12 ecosystem competitiveness factors, including institutions, infrastructure, the macroeconomic environment, health and primary education, higher education and training, and market efficiency for goods, labour, and finances. Other factors include technological readiness, market size, business sophistication, and innovation. The 12 elements are measured individually and reported as well as consolidated into a single index.

A great effort has been made in this direction also by the World Bank with the “Ease of Doing Business” project. The findings provide results on two measures: the ease of doing business score and the ease of doing business ranking. The ease of doing business score evaluates an economy based on its performance in relation to the 41 measures of regulatory best practise for 10 Doing Business topics (Starting a business, Dealing with construction permits, Getting electricity, Registering property, Getting credit, Protecting minority investors, Paying taxes, Trading across borders, Enforcing contracts, Resolving insolvency). These score benchmark economies according to their adherence to regulatory best practises and indicate how close they are to achieving the highest possible levels of regulatory performance (0 represents the lowest performance, 100 represents the highest). The ease of doing business ranking can take on values from 1 to 190, sorting countries based on how easy it is to do business in their territory (World Bank, 2020).

It is however necessary to note that most of the mentioned indices do not include weights, thus providing a simplified perspective of reality, or use weighting methods that are generally criticised because of their arbitrariness.

Digitalisation and digital transformation are disrupting business processes and models as well as reshaping entrepreneurship. However, the intersection between the two concepts of digitalisation and entrepreneurial ecosystem still seems to be understudied in academic literature, except from some contributions. In the digital economy, a large part of the emerging and successful new ventures leverages digital technologies to perform their activities.

Before diving into the conceptualisation of digital entrepreneurship ecosystem, it is appropriate to clarify the idea of digital ecosystem, which arose in the 2000s. A digital ecosystem can be

defined as “a self-organizing, scalable and sustainable system composed of heterogeneous digital entities and their interrelations focusing on interactions among entities to increase system utility, gain benefits, and promote information sharing, inner and inter cooperation and system innovation” (Li *et al.*, 2012, p.119).

A relevant conceptualization in entrepreneurial literature has been proposed by Autio *et al.* (2018). The authors suggest that the evaluation of a digital entrepreneurial system should consider 4 general framework conditions as well as 4 systemic framework conditions. The general framework conditions are: (1) Culture and Informal Institutions, (2) Formal Institutions, Regulation, and Taxation, (3) Market Conditions, and (4) Physical Infrastructure. The degree of digitalization of these conditions can be measured by associating to each of them a measure of the digital context. The systemic resource-related conditions are: (1) Human Capital, (2) Knowledge Creation and Dissemination, (3) Finance, (4) Networking and Support. They are supposed to vary depending on the stage of development of an entrepreneurial activity and, for this reason, they are differentiated into Stand-up, Start-up, and Scale-up stages.

From a theoretical point of view, the concept of digital entrepreneurial ecosystem derives from the intersection between the concepts of digital ecosystem and entrepreneurial ecosystem. According to Sussan & Acs (2017), in understanding a digital ecosystem, digital technologies should be thought of as the non-living element, while people who make use of them as the living element. The two elements interact with each other, generating dynamics and changes that characterise the ecosystem itself. As a consequence, the two building components of a digital ecosystem are the digital infrastructure and the users. The entrepreneurial ecosystem is instead seen as composed of agents and institutions.

Digital infrastructure is defined as a socially integrated mechanical system comprising technology and human components, network, systems, and processes that produce self-reinforcing feedback loops. By users, we mean anyone who has access to digital technologies. Consistently, according to Autio *et al.* (2018), entrepreneurship is impacted by digitalisation by means of what is referred to as *digital affordance*, the possibility to conduct wholly new activities or already existing ones in novel ways. The concept of affordance has its roots in the work by Gibson (1979) who raised the issue of affordance of natural objects. In his view, human beings and animals perceive natural objects differently depending on the possibilities these objects offer for action (e.g. a river may represent a place to drink for a buffalo while a rock may provide a shelter for a reptile) (Gibson, 1979). The term users refers to the entire population having access to digital technologies. In this context, characterised by an intense net of interactions within the digital community, some users may accidentally become entrepreneurs by creating novel goods or services that enrich and improve the ecosystem itself (Shah & Tripsas, 2007).

3. Research design

The present contribution takes into account 33 indicators, grouped into 10 subdimensions and 4 dimensions (see table 1) summarising the most common digital entrepreneurial pillars emerging in literature. Data are gathered from the Digital Economy and Society Index (DESI) that provides information on the digital progress made by European countries.

We use DESI because it was developed in line with the objectives of the 2030 *Digital Compass: the European Way for the Digital Decade* Communication which defines the EU’s vision for digital transformation to realise by 2030 and outlines specific digital goals. The four cardinal points of this digital agenda are: a digitally skilled population and highly skilled digital professions; secure and sustainable digital infrastructures; digital transformation of businesses, and the digitalisation of public services (European Commission, 2021a). The DESI is built around them and is composed of four main dimensions: Human Capital, Connectivity, Integration of digital technology, Digital public services. The index has a three-level structure, which means that for each dimension, a number of sub-dimensions and micro level indicators are identified. The complete structure is

presented in table 1. Starting from the DESI index, the aim of the present paper is to provide an application of Stochastic Multicriteria Acceptability Analysis (SMAA; Lahdelma *et al.*, 1998) as a precise, robust, and reliable measurement methodology for the measurement of digital entrepreneurial ecosystems at the national level. We aim at comparing different countries by evaluating, ranking, and comparing them as digital entrepreneurial ecosystems, by applying SMAA methodology.

Tab. 1: DESI structure

Dimension	Sub-dimension	Indicator
1 Human capital	1a Internet user skills	1a1 At least basic digital skills
		1a2 Above basic digital skills
		1a3 At least basic software skills
	1b Advanced skills and development	1b1 ICT specialists
		1b2 Female ICT specialists
		1b3 Enterprises providing ICT training
1b4 ICT graduates		
2 Connectivity	2a Fixed broadband take-up	2a1 Overall fixed broadband take-up
		2a2 At least 100 Mbps fixed broadband take-up
		2a3 At least 1 Gbps take-up
	2b Fixed broadband coverage	2b1 Fast broadband (NGA) coverage
		2b2 Fixed Very High-Capacity Network (VHCN) coverage
	2c Mobile broadband	2c1 4G coverage
		2c2 5G readiness
		2c3 5G coverage
		2c4 Mobile broadband take-up
	2d Broadband prices	2d1 Broadband price index
3 Integration of digital technology	3a Digital intensity	3a1 SMEs with at least a basic level of digital intensity
	3b Digital technologies for businesses	3b1 Electronic information sharing
		3b2 Social media
		3b3 Big data
		3b4 Cloud
		3b5 AI
		3b6 ICT for environmental sustainability
	3c e-Commerce	3b7 e-Invoices
		3c1 SMEs selling online
		3c2 e-Commerce turnover
3c3 Selling online cross-border		
4 Digital public services	4a e-Government	4a1 e-Government users
		4a2 Pre-filled forms
		4a3 Digital public services for citizens
		4a4 Digital public services for businesses
		4a5 Open data

Source: European Commission (2021)

Actually, DESI index is a composite index (Greco *et al.*, 2019) assigning a value to each European Country based on thirty-three elementary criteria structured hierarchically and weighted as follows:

1. Human capital (g_1): 25%
 - 1.1 Internet users skills ($g_{(1,1)}$): 50%
 - 1.1.1 At least basic digital skills ($g_{(1,1,1)}$): 50%
 - 1.1.2 Above basic digital skills ($g_{(1,1,2)}$): 25%
 - 1.1.3 At least basic software skills ($g_{(1,1,3)}$): 25%
 - 1.2 Advanced skills and development ($g_{(1,2)}$): 50%
 - 1.2.1 ICT specialists ($g_{(1,2,1)}$): 33.33%
 - 1.2.2 Female ICT specialists ($g_{(1,2,2)}$): 33.33%
 - 1.2.3 Enterprises providing ICT training ($g_{(1,2,3)}$): 16.67%
 - 1.2.4 ICT graduates ($g_{(1,2,4)}$): 16.67%
2. Connectivity (g_2): 25%

- 2.1 Fixed broadband take-up ($g_{(2,1)}$): 25%
 - 2.1.1 Overall fixed broadband take-up ($g_{(2,1,1)}$): 33.33%
 - 2.1.2 At least 100 Mbps fixed broadband take-up ($g_{(2,1,2)}$): 33.33%
 - 2.1.3 At least 1 Gbps take-up ($g_{(2,1,3)}$): 33.33%
- 2.2 Fixed broadband coverage ($g_{(2,2)}$): 25%
 - 2.2.1 Fast broadband (NGA) coverage ($g_{(2,2,1)}$): 25%
 - 2.2.2 Fixed Very High Capacity Network (VHCN) coverage ($g_{(2,2,2)}$): 50%
 - 2.2.3 Fibre to the precises (FTTP) coverage ($g_{(2,2,3)}$): 25%
- 2.3 Mobile broadband ($g_{(2,3)}$): 40%
 - 2.3.1 5G Spectrum ($g_{(2,3,1)}$): 25%
 - 2.3.2 5G coverage ($g_{(2,3,2)}$): 50%
 - 2.3.3 Mobile broadband take-up ($g_{(2,3,4)}$): 25%
- 2.4 Broadband prices ($g_{(2,4)}$): 10%
 - 2.4.1 Broadband price index ($g_{(2,4,1)}$): 100%
- 3. Integration of digital technology (g_3): 25%
 - 3.1 Digital intensity ($g_{(3,1)}$): 15%
 - 3.1.1 SMEs with at least a basic level of digital intensity ($g_{(3,1,1)}$): 100%
 - 3.2 Digital technologies for businesses ($g_{(3,2)}$): 70%
 - 3.2.1 Electronic information sharing ($g_{(3,2,1)}$): 10%
 - 3.2.2 Social media ($g_{(3,2,2)}$): 10%
 - 3.2.3 Big data ($g_{(3,2,3)}$): 20%
 - 3.2.4 Cloud ($g_{(3,2,4)}$): 20%
 - 3.2.5 AI ($g_{(3,2,5)}$): 20%
 - 3.2.6 ICT for environmental sustainability ($g_{(3,2,6)}$): 10%
 - 3.2.7 E-Invoices ($g_{(3,2,7)}$): 10%
 - 3.3 E-Commerce ($g_{(3,3)}$) 15%
 - 3.3.1 SMEs selling online ($g_{(3,3,1)}$): 33.33%
 - 3.3.2 E-Commerce turnover ($g_{(3,3,2)}$): 33.33%
 - 3.3.3 Selling online cross-border ($g_{(3,3,3)}$): 33.33%
- 4. Digital public services (g_4): 25%
 - 4.1 e-Government ($g_{(4,1)}$): 100%
 - 4.1.1 e-Government users ($g_{(4,1,1)}$): 14.29%
 - 4.1.2 Pre-filled forms ($g_{(4,1,2)}$): 14.29%
 - 4.1.3 Digital public services for citizens ($g_{(4,1,3)}$): 28.57%
 - 4.1.4 Digital public services for businesses ($g_{(4,1,4)}$): 28.57%
 - 4.1.5 Open data ($g_{(4,1,5)}$): 14.29%.

This means that Human capital, Connectivity, Integration of digital technology, and Digital public services are equally weighted. Under the Human capital macro-criterion, internet users skills and Advanced skills and development have the same weight. The elementary criteria descending from a last but one level criterion have then all the same weights or double. For example, considering Internet users skills, Above basic digital skills and At least basic digital content creation skills have the same weight (25%), while At least Basic Digital Skills has a weight double the other two (50%).

Evaluations of the countries on the thirty-three elementary criteria are normalized to put them on the same [0,1] scale considering a minimum and a maximum value for each of them. Therefore, these evaluations are aggregated to have a comprehensive score on each macro-criterion and, at the global level.

Looking at the computation of the index, the following main issues can be underlined:

- *Normalization*: Many normalization techniques can be used to put all the evaluations on the same scale. However, different normalizations assign different values and, therefore, different aggregated values to the considered countries. Moreover, each normalization implies a loss of information concerning the original data,
- *Weighting*: As explained above, the DESI index is computed considering certain fixed weights for all criteria in the hierarchy. However, the choice of the weights is arbitrary and different weights vectors would provide different scores to the considered countries and, therefore, different recommendations could be obtained,
- *Hierarchical structure*: The DESI index aggregate as a whole the evaluations on the thirty-three elementary criteria computing, therefore, a global score taking all of them together. From a policy-making point of view, it could be interesting getting not only a global level ranking but also a ranking for each of the macro-criteria obtaining more insight into the weak and strong points of each Country.

In this paper, we shall tackle the second and third issues. On the one hand, regarding the weighting issue, we shall take into account a whole set of weights vectors and not only the one used to compute the DESI index. In this way, we shall show how a small variability in the weights attached to the criteria will imply a certain variability in the ranking of the Countries. To this aim, we shall apply the Stochastic Multicriteria Acceptability Analysis (SMAA; Lahdelma *et al.*, 1998; Pelissari *et al.*, 2020). On the other hand, to have a ranking not only at the comprehensive level but also considering the four macro-criteria in the hierarchy we shall apply the Multiple Criteria Hierarchy Process (Corrente *et al.*, 2012) recently introduced in the literature.

4. Methodology. Multiple Criteria Decision Analysis and Stochastic Multicriteria Acceptability Analysis

In Multiple Criteria Decision Analysis (Greco *et al.*, 2016; Keeney & Raiffa, 1976) a set of alternatives $A = \{a, b, c, \dots\}$ is evaluated on a set of criteria $G = \{g_1, \dots, g_m\}$ to deal with a ranking, choice, or sorting problem (Roy, 1996). Several different MCDA methods have been presented in the literature and all of them aim to aggregate the evaluations of the alternatives to give a recommendation on the problem at hand. In particular, Multiple Attribute Value Theory (MAVT; Keeney & Raiffa, 1976), through a value function, assigns a real number to each alternative being representative of its goodness concerning the considered problem. Among the possible value functions, the simplest and most used in practice is the weighted sum

$$WS(a, \mathbf{w}) = WS(g_1(a), \dots, g_m(a), w_1, \dots, w_m) = \sum_{j=1}^m w_j \cdot g_j(a).$$

Of course, the value assigned from the weighted sum to each alternative depends on the weights assigned to the criteria. SMAA has been presented for the first time by Lahdelma, Hokkanen, Salminen (1998). It produces information on the problem at hand taking into account a certain variability in the alternatives' evaluations as well as on the weights of the considered criteria (the parameters of the model, in general). In our case, we shall consider the same evaluations used in the DESI index and, therefore, we shall take into account a variability related only to the weights of criteria. Denoting by

$$\mathbf{W} = \left\{ (w_1, \dots, w_m) \in R^m : w_j \geq 0 \text{ and } \sum_{j=1}^m w_j = 1 \right\}$$

the whole space of weights vectors that could be used, SMAA produces information in statistical terms considering a sampling of weights vectors in W . Fixed a certain alternative a and a weight vector \mathbf{w} , SMAA defines the following rank function

$$\text{rank}(a, \mathbf{w}) = 1 + \sum_{b \neq a} \rho(WS(b, \mathbf{w}) > WS(a, \mathbf{w}))$$

where $\rho(\text{true}) = 1$ and $\rho(\text{false}) = 0$. Denoting by $\mathbf{W}_{\text{sample}}$ the set of weight vectors sampled from \mathbf{W} , for each $a, b \in A$ and each rank position $s = 1, \dots, |A|$ SMAA computes the following sets

$$\begin{aligned} \mathbf{W}^s(a) &= \{\mathbf{w} \in \mathbf{W}_{\text{sample}} : \text{rank}(a, \mathbf{w}) = s\} \\ \mathbf{W}(a, b) &= \{\mathbf{w} \in \mathbf{W}_{\text{sample}} : WS(a, \mathbf{w}) > WS(b, \mathbf{w})\} \end{aligned}$$

and, therefore, the following indices:

- The *rank acceptability index*, $b^s(a)$: it is the frequency with which a fills the position s and it is computed as

$$b^s(a) = \frac{|\mathbf{W}^s(a)|}{|\mathbf{W}_{\text{sample}}|}.$$

It is a value in $[0,1]$ and the best alternatives are those presenting a high-rank acceptability index for the first-rank positions,

- The central weight vector of a for position s is the barycenter of $\mathbf{W}^s(a)$ and it is computed as the average, component by component, of the weight vectors in $\mathbf{W}^s(a)$. It represents the average preferences giving to a position s ,
- The *pairwise winning index*, $p(a, b)$: it is the frequency with which a is preferred to b and it is computed as

$$p(a, b) = \frac{|\mathbf{W}(a, b)|}{|\mathbf{W}_{\text{sample}}|}.$$

It is a value in $[0,1]$ and the greater $p(a, b)$, the more a is preferred to b .

Based on the rank acceptability indices, following Corrente *et al.* 2019, the following further information can be computed for each a :

- The lowest and the greatest rank positions that can be obtained by a ,
- The three most frequent positions that can be obtained by a .

In our context, we shall assume that the weight assigned to the elementary criteria as well as to the second and third-level criteria are the same used in the computation of the DESI index and illustrated in the previous section, while we considered different weights for the four macro-criteria. In addition to the case in which the four criteria are equally weighted, we assumed that the weight of each macro-criterion can vary in the interval $[20\%, 30\%]$.

In practical problems, criteria are not sited at the same level but they are organized hierarchically. It is therefore possible underlying a root criterion, being the main objective of the problem; some first-level criteria having subcriteria descending from them; finally, the elementary criteria on which the evaluation of the alternatives is provided are placed at the bottom of the hierarchy.

The MCHP has been presented by Corrente, Greco and Słowiński (2012) to deal with problems in which criteria are structured hierarchically. The main objective of MCHP is then providing recommendations not only at the global level, that is, considering all criteria simultaneously, but also considering each node of the hierarchy.

From a computational point of view, denoted by g_r a certain criterion in the hierarchy, MCHP computes the weighted sum of an alternative a on g_r considering only the elementary criteria descending from it, that is, $EL(g_r) \subseteq \{g_1, \dots, g_m\}$. The weighted sum of a on criterion g is then computed as follows:

$$WS_{g_r}(a, \mathbf{w}) = \sum_{g_t \in EL(g_r)} g_t(a) \cdot w_t.$$

All indices of SMAA can easily be computed defining for each $a, b \in A$, for each rank position s and each macro-criterion g_r the following sets:

- $\mathbf{W}_{g_r}^s(a) = \{\mathbf{w} \in \mathbf{W}_{Sample} : rank(a, \mathbf{w}, g_r) = s\}$ where
 $rank(a, \mathbf{w}, g_r) = 1 + \sum_{b \neq a} \rho(WS_{g_r}(b, \mathbf{w}) > WS_{g_r}(a, \mathbf{w}))$
- $\mathbf{W}_{g_r}(a, b) = \{\mathbf{w} \in \mathbf{W}_{Sample} : WS_{g_r}(a, \mathbf{w}) > WS_{g_r}(b, \mathbf{w})\}$.

Therefore, the typical indices of SMAA are extended to the MCHP context as follows:

- The partial rank acceptability index of a for criterion g_r and position $s \in \{1, \dots, m\}$:

$$b_{g_r}^s(a) = \frac{|\mathbf{W}_{g_r}^s(a)|}{|\mathbf{W}_{Sample}|}$$

- The partial central weight vector of a for criterion g_r and for position $s \in \{1, \dots, m\}$: It is computed as the average, component by component, of the weight vectors in $\mathbf{W}_{g_r}^s(a)$,
- The partial pairwise winning index for criterion g_r , $p_{g_r}(a, b)$:

$$p_{g_r}(a, b) = \frac{|\mathbf{W}_{g_r}(a, b)|}{|\mathbf{W}_{Sample}|}.$$

5. Empirical analysis and results

Applying SMAA to the DESI input data, the rank acceptability indices, the pairwise winning indices and the central weight vectors are obtained.

Table 2 reports illustrates the frequency with which each country achieves each of the possible positions in the overall ranking, from the 1st to the 27th (which is the total number of countries considered). The results show that Denmark and Finland attain the 1st position with a frequency of 38,82 and 61,18 respectively. In contrast, Bulgaria and Greece take the 26th position with a frequency of 90,86 and 9,15 and while the last position is occupied by Romania with a frequency of 100. The results are enriched by the figures given in Tables 3 and 4. Table 3 shows, for each country, the best and the worst positions attainable based on the results of the rank acceptability indices.

Tab. 2: Rank acceptability index

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14
Austria	0	0	0	0	0	0	0	0	2,987	96,931	0,082	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0,022	0,285
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Czechia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	38,824	61,176	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	97,013	2,939	0,047	0,001	0	0
Finland	61,176	38,824	0	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	0	0	0	0	0	0,032	41,164	24,55	31,821	2,433
Germany	0	0	0	0	0	0	0	0	0	0,036	4,955	18,605	33,514	42,705
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	100	0	0	0	0	0	0	0	0	0
Italy	0	0	0	0	0	0	0	0	0	0	0	0	0	0,011
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	0	0	0	0	0	0	0	0	0	0,018	15,501	13,377	16,405	54,513
Luxembourg	0	0	0	0	0	0	0	100	0	0	0	0	0	0
Malta	0	0	0	0	0	54,581	45,419	0	0	0	0	0	0	0
Netherlands	0	0	100	0	0	0	0	0	0	0	0	0	0	0
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0	0	0	0	0,053
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0,044	38,251	43,467	18,238	0
Spain	0	0	0	0	0	45,419	54,581	0	0	0	0	0	0	0
Sweden	0	0	0	100	0	0	0	0	0	0	0	0	0	0

Tab. 2: continued

	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	#25	#26	#27
Austria	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	25,621	34,063	28,195	5,586	4,815	1,413	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	9,145	90,855	0
Croatia	0	0	0	0,086	1,269	10,923	87,722	0	0	0	0	0	0
Cyprus	0	0	0,495	3,784	8,642	75,839	11,24	0	0	0	0	0	0
Czechia	0	0,192	7,257	56,113	35,231	1,207	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0	0	0	0	0	0
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0	0	0
France	0	0	0	0	0	0	0	0	0	0	0	0	0
Germany	0,181	0,004	0	0	0	0	0	0	0	0	0	0	0
Greece	0	0	0	0	0	0	0	0	0	2,503	88,352	9,145	0
Hungary	0	0	0	0	0	0	0	70,981	29,019	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	4,143	8,636	25,969	21,108	39,434	0,698	0,001	0	0	0	0	0	0
Latvia	4,999	22,626	37,486	13,323	10,609	9,92	1,037	0	0	0	0	0	0
Lithuania	0,186	0	0	0	0	0	0	0	0	0	0	0	0
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Poland	0	0	0	0	0	0	0	0	0	97,497	2,503	0	0
Portugal	64,87	34,479	0,598	0	0	0	0	0	0	0	0	0	0
Romania	0	0	0	0	0	0	0	0	0	0	0	0	100
Slovakia	0	0	0	0	0	0	0	29,019	70,981	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	0	0	0	0	0	0	0	0	0	0	0
Sweden	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: our elaboration

Tab. 3: Best-worst position

	Best Position	%	Worst Position	%
Austria	9	2,987	11	0,082
Belgium	13	0,022	20	1,413
Bulgaria	25	9,145	26	90,86
Croatia	18	0,086	21	87,72
Cyprus	17	0,495	21	11,24
Czechia	16	0,192	20	1,207
Denmark	1	38,82	2	61,18
Estonia	9	97,01	12	0,001
Finland	1	61,18	2	38,82
France	10	0,032	14	2,433
Germany	10	0,036	16	0,004
Greece	24	2,503	26	9,145
Hungary	22	70,98	23	29,02
Ireland	5	100		
Italy	14	0,011	21	0,001
Latvia	15	4,999	21	1,037
Lithuania	10	0,018	15	0,186
Luxembourg	8	100		
Malta	6	54,58	7	45,42
Netherlands	3	100		
Poland	24	97,5	25	2,503
Portugal	14	0,053	17	0,598
Romania	27	100		
Slovakia	22	29,02	23	70,98
Slovenia	10	0,044	13	18,24
Spain	6	45,42	7	54,58
Sweden	4	100		

Source: our elaboration

Tab. 4: Most frequent position

	Most frequent 1	%	Most frequent 2	%	Most frequent 3	%
Austria	10	96,931	9	2,987	11	0,082
Belgium	16	34,063	17	28,195	15	25,621
Bulgaria	26	90,855	25	9,145		
Croatia	21	87,722	20	10,923	19	1,269
Cyprus	20	75,839	21	11,24	19	8,642
Czechia	18	56,113	19	35,231	17	7,257
Denmark	2	61,176	1	38,824		
Estonia	9	97,013	10	2,939	11	0,047
Finland	1	61,176	2	38,824		
France	11	41,164	13	31,821	12	24,55
Germany	14	42,705	13	33,514	12	18,605
Greece	25	88,352	26	9,145	24	2,503
Hungary	22	70,981	23	29,019		
Ireland	5	100				
Italy	19	39,434	17	25,969	18	21,108
Latvia	17	37,486	16	22,626	18	13,323
Lithuania	14	54,513	13	16,405	11	15,501
Luxembourg	8	100				
Malta	6	54,581	7	45,419		
Netherlands	3	100				
Poland	24	97,497	25	2,503		
Portugal	15	64,87	16	34,479	17	0,598
Romania	27	100				
Slovakia	23	70,981	22	29,019		
Slovenia	12	43,467	11	38,251	13	18,238
Spain	7	54,581	6	45,419		
Sweden	4	100				

Source: our elaboration

As already evidenced, Denmark attains the 1st position with a frequency of 38,82 and Finland with a frequency of 61,18. These are the only two countries able to attain the optimal position, which means that there is at least one weight vector for which they turn out to be occupy the best

position in the ranking and, thanks to the adoption of SMAA methodology, we are also able to know the probability to occupy a certain position. Therefore, even though both the countries can range from the first (best) to the second (worst) position, the above-mentioned probabilities lead to deduce that, given the higher probability for Finland to attain the first position with respect to the probability for Denmark, there is a larger share of weight vectors for which Finland can occupy the first position.

Turning the attention to the last positions, the 23rd is the worst position attainable by Hungary and Slovakia with a frequency of 29,02 and 70,98 respectively while the last position is occupied by Romania with a frequency of 100. Table 4 presents the most frequent position, i.e., the mode, for each country. The most frequent position for Finland is first, for Denmark is second, for Netherlands is third (100%), for Sweden is fourth (100%), for Ireland is fifth (100%), for Malta is sixth (54,58%), and so on. The table also contains the second and third most frequent positions for each country.

Table 5 presents the pairwise winning index for all the possible pairs of countries. This index represents the frequency with which a country is preferred over another. For example, Finland is preferred to all the other countries with a frequency of 100% apart from Denmark, with respect to which Finland is preferred with a frequency of 61,18%. This is an interesting insight, considering that Finland and Denmark are the two overall best performing countries.

Another example is that Italy is preferred over Croatia, and Cyprus with a frequency of 99,3% and 99,94% respectively; Portugal is preferred over Italy (95,6%). Another interesting insight is linked to the strength of the preferences. While, on one hand, some preferences are strong enough to denote an almost undeniable direction of the preference itself, on the other hand there are cases in which the advantage on one country over another is quite small. For example, comparing Slovenia to France, it turns out that Slovenia is preferred over France for 54,05% of the weight vectors but, for the remaining 45,95%, the preference is inverted.

However, apart from the global indices, additional more detailed information can be extracted by applying SMAA. In table 6, 7, 8 and 9, we present the exemplification cases of Italy, Ireland, Finland and Romania. We selected 4 countries for paper constraints, but the same tables are available for all the 27 countries. These tables are extremely informative for policymakers since they show the barycenters (central weight vectors) for the various positions, thus revealing which aspects are mainly responsible for a country to attain a certain position. The central weight vector is indeed the representation of how important the factors are in influencing the possibility of the country to attain the various positions in the ranking. In other words, the results are able to inform about the strength and weaknesses of every single country.

Looking at table 6, it starts with the 14th position because it is the best position attainable for Italy. Although the differences are not so sharp, we can make some interesting considerations. First of all, focusing on “Digital technologies for businesses”, we can note how, going from the worst to the best position, the importance of this factor increases. Similarly, an enhancement in the positions is also gained with the growing importance of “Internet users skills”. This means that they can be considered as a strength and investing in these areas would avoid losing ground. The policy maker should implement actions to improve these aspects in order not to lose ground. Looking at the differences between the best and the worst position (first and last row), it is also worth noting that an increase in the weight of “Advanced skills and development”, “Fixed broadband coverage”, “Human capital” and “Digital public services” leads the country to move down in the ranking, which suggests that these factors are weaknesses to invest in for a better positioning. Concerning Ireland and Romania (table 7 and 8), they always maintain the same position (5th and 27th respectively). Looking at table 9 for Finland, what we can highlight is that the Dimension “Human capital” can be considered as a strength while “Connectivity” as a weakness. Although keeping in mind that this country is the best performer, it could be interesting to know that there is room for improvement in connectivity.

Digital skills can be therefore considered as a key factor for the improvement of a digital entrepreneurial ecosystem. Although the role of digital skills as a driver of innovative performance

have been widely investigated (Scuotto *et al.*, 2021), they may turn out to be relevant also for new firms' development.

Tab. 5: Pairwise winning index

	Austria	Belgium	Bulgaria	Croatia	Cyprus	Czechia	Denmark	Estonia	Finland	France	Germany	Greece	Hungary	Ireland	Italy	Latvia	Lithuania	Luxembourg	Malta	Netherlands	Poland	Portugal	Romania	Slovakia	Slovenia	Spain	Sweden	
Austria	0	100	100	100	100	100	0	2,99	0	100	100	100	100	0	100	100	100	0	0	100	100	100	100	100	100	0	0	
Belgium	0	0	100	100	97,9	92,7	0	0	0	0	0,19	100	100	0	80,8	68,8	0,15	0	0	0	100	26,2	100	100	0	0	0	
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	9,15	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	
Croatia	0	0	100	0	11,5	0	0	0	0	0	0	100	100	0	0,7	1,56	0	0	0	0	100	0	100	100	0	0	0	
Cyprus	0	2,05	100	88,5	0	4,8	0	0	0	0	0	100	100	0	0,06	11	0	0	0	0	100	0	100	100	0	0	0	
Czechia	0	7,33	100	100	95,2	0	0	0	0	0	0	100	100	0	43,4	24,1	0	0	0	0	100	0	100	100	0	0	0	
Denmark	100	100	100	100	100	100	0	100	38,8	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Estonia	97	100	100	100	100	100	0	0	0	100	100	100	100	0	100	100	100	0	0	0	100	100	100	100	100	0	0	
Finland	100	100	100	100	100	100	61,2	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
France	0,02	100	100	100	100	100	0	0,01	0	0	85,6	100	100	0	100	100	72,9	0	0	0	100	100	100	100	46	0	0	
Germany	0	99,8	100	100	100	100	0	0,04	0	14,4	0	100	100	0	100	100	55,2	0	0	0	100	100	100	100	16,1	0	0	
Greece	0	0	90,9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,5	0	100	0	0	0	0	
Hungary	0	0	100	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	100	0	71	0	0	0	
Ireland	100	100	100	100	100	100	0	100	0	100	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100	0	
Italy	0	19,2	100	99,3	99,9	56,6	0	0	0	0	0	100	100	0	0	35,5	0,01	0	0	0	0	100	4,4	100	100	0	0	0
Latvia	0	31,2	100	98,4	89	75,9	0	0	0	0	0	100	100	0	64,5	0	0	0	0	0	0	100	5,08	100	100	0	0	0
Lithuania	0,02	99,9	100	100	100	100	0	0	27,1	44,8	100	100	100	0	100	100	0	0	0	0	100	100	100	100	17,9	0	0	
Luxembourg	100	100	100	100	100	100	0	100	0	100	100	100	100	0	100	100	100	0	0	0	100	100	100	100	100	0	0	
Malta	100	100	100	100	100	100	0	100	0	100	100	100	100	0	100	100	100	100	0	0	100	100	100	100	100	54,6	0	0
Netherlands	100	100	100	100	100	100	0	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
Poland	0	0	100	0	0	0	0	0	0	0	0	97,5	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	
Portugal	0	73,8	100	100	100	100	0	0	0	0,01	100	100	100	0	95,6	94,9	0,04	0	0	0	100	0	100	100	0	0	0	
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Slovakia	0	0	100	0	0	0	0	0	0	0	0	100	29	0	0	0	0	0	0	0	0	100	0	100	0	0	0	
Slovenia	0,04	100	100	100	100	100	0	0	54	83,9	100	100	0	100	100	82,1	0	0	0	0	100	100	100	100	0	0	0	
Spain	100	100	100	100	100	100	0	100	0	100	100	100	100	0	100	100	100	100	45,4	0	100	100	100	100	100	0	0	
Sweden	100	100	100	100	100	100	0	100	0	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	0	

Source: our elaboration

Tab. 6: Barycenters for all positions (Italy)

Position	Internet users skills	Advanced skills and development	Fixed broadband take-up	Fixed broadband coverage	Mobile broadband	Broadband prices	Digital intensity	Digital technologies for businesses	e-Commerce	Human capital	Connectivity	Integration of digital technology	Digital public services
14,00	0,52	0,48	0,28	0,21	0,44	0,06	0,17	0,72	0,11	0,21	0,30	0,29	0,20
15,00	0,50	0,50	0,23	0,22	0,43	0,12	0,16	0,70	0,14	0,22	0,29	0,27	0,22
16,00	0,50	0,50	0,24	0,24	0,42	0,10	0,15	0,70	0,14	0,24	0,29	0,25	0,23
17,00	0,50	0,50	0,25	0,25	0,41	0,10	0,15	0,70	0,14	0,24	0,26	0,26	0,23
18,00	0,50	0,50	0,25	0,26	0,39	0,10	0,15	0,70	0,14	0,24	0,25	0,26	0,26
19,00	0,50	0,50	0,25	0,26	0,39	0,10	0,15	0,70	0,16	0,27	0,23	0,24	0,26
20,00	0,52	0,48	0,27	0,27	0,38	0,08	0,13	0,69	0,18	0,30	0,21	0,25	0,24
21,00	0,45	0,55	0,28	0,30	0,37	0,05	0,16	0,66	0,18	0,30	0,20	0,21	0,29

Source: our elaboration

Tab. 7: Barycenters for all positions (Ireland)

Position	Internet users skills	Advanced skills and development	Fixed broadband take-up	Fixed broadband coverage	Mobile broadband	Broadband prices	Digital intensity	Digital technologies for businesses	e-Commerce	Human capital	Connectivity	Integration of digital technology	Digital public services
5,00	0,50	0,50	0,25	0,25	0,40	0,10	0,15	0,70	0,15	0,25	0,25	0,25	0,25

Source: our elaboration

Tab. 8: Barycenters for all positions (Romania)

Position	Internet users skills	Advanced skills and development	Fixed broadband take-up	Fixed broadband coverage	Mobile broadband	Broadband prices	Digital intensity	Digital technologies for businesses	e-Commerce	Human capital	Connectivity	Integration of digital technology	Digital public services
27,00	0,50	0,50	0,25	0,25	0,40	0,10	0,15	0,70	0,15	0,25	0,25	0,25	0,25

Source: our elaboration

Tab. 93: Barycenters for all positions (Finland)

Position	Internet users skills	Advanced skills and development	Fixed broadband take-up	Fixed broadband coverage	Mobile broadband	Broadband prices	Digital intensity	Digital technologies for businesses	e-Commerce	Human capital	Connectivity	Integration of digital technology	Digital public services
1,00	0,50	0,50	0,25	0,25	0,40	0,11	0,15	0,70	0,15	0,26	0,23	0,25	0,25
2,00	0,50	0,50	0,25	0,26	0,40	0,09	0,15	0,70	0,16	0,23	0,28	0,25	0,24

Source: our elaboration

6. Concluding remarks

Entrepreneurship is a complex phenomenon, and many different factors may exert influence over it in a certain entrepreneurship ecosystem. Evaluating the ability of a territory to encourage and support entrepreneurial initiative becomes even more challenging in the digital era, where many entrepreneurial activities are digital-oriented.

The implications of the present work are both theoretical and practical. From a theoretical perspective, the most relevant contribution deriving from the application of SMAA to DESI data consists in the creation of a probabilistic ranking that is more robust and reliable than the conventional single ranking derived from composite indices constructed with a single weight vector. Most of these indices, including DESI, are indeed computed relying on fixed weights identified by a panel of experts and are, for this reason, affected by a degree of subjectivity. SMAA allows to consider how a variation in the assigned weights is able to affect the final ranking.

These results have relevant practical implications for both policy makers and businesses. On one hand, the identification of strengths and weaknesses of the different countries provides useful guidelines for policy makers decisions aiming to support territorial development; on the other hand, it allows businesses to identify market opportunities to develop enabling technologies for the improvement of digital entrepreneurial ecosystems.

Furthermore, some future research directions can be identified. We applied SMAA allowing for a limited variation of the weights assigned in the computation of DESI. This however produced some considerable fluctuations in the position of various countries (i.e. Italy, originally assigned to the 18th position, turns out to attain positions from the 14th to the 21st). Future applications may take into account a broader range of weights, thus providing even more relevant changes in the ranking. Other datasets could also be used to enhance robustness. In addition, from a methodological point of view, we intervened on weights assignment and on the hierarchical structure of the index but it is also possible to intervene on normalisation (both adopting a different normalisation method or applying a model that does not take normalisation into account) and on the interaction between criteria as an improvement opportunity, reconsidering the DESI methodological note.

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Digging local roots and territorial capital in management: a Structured Literature Review (SLR) and bibliometric analysis

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Abstract

Framing of the research. *This study contributes to the debate on territorial capital in management theory by investigating past and present scientific literature. Since little is known about how to express territoriality and local roots' potential, it explores this topic using a structured literature review (SLR) approach.*

Purpose of the paper. *Based on the SLR's outcomes, it aims to answer three research questions intended to provide the state of the art in the current literature, identify the key research blocks, and deliver recommendations for future research.*

Methodology. *It analyses scientific articles published in journals from 1980 to 2022, underlying noteworthy insights about territorial capital applications in management. A sample of 185 articles indexed in Scopus was preliminarily submitted for bibliometric analysis. Finally, 87 documents were examined with cluster and content analyses to identify the underlying research areas.*

Results. *Data revealed the recent interest in this topic, especially from the European geographical area, as regards the number of documents and citations. Furthermore, the bibliographic coupling confirms the multidisciplinary interest in 'territorial capital' extensions, such as 'social capital'.*

Research limitations. *Although the data collection and SLR protocol were comprehensive and rigorous, such restrictions may result in omitting literature on the topic under study.*

Managerial implications. *Territorial capital can be pivotal in defining strategies to promote brands and/or tourism development strategies through the rediscovery of local roots and territorial characteristics.*

Originality of the paper. *To date, no study has provided a comprehensive SLR dealing with territorial capital from a managerial perspective.*

Key words: *territorial capital; management; local roots; social capital; territoriality; structured literature review.*

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1. Introduction

According to Tóth (2015), territorial capital has recently gained considerable attention. It was first introduced in 2001 by OECD in a generic and flexible definition indicating that each region is characterised by a specific territorial capital that generates higher returns for certain investments rather than others (Camagni, 2008; OECD, 2001). Although the success of this definition, it does not fully explain the real essence of this concept. Therefore, several authors tried to define it clearly. Camagni (2009) defined territorial capital as a set of localised assets (i.e., natural, artificial, human, organisational, relational and cognitive) expressing a territory's potential. Milone *et al.* (2008) linked territorial capital to a specific stock of material and immaterial resources available only to people living there. Furthermore, Berti (2011) highlighted the comparative advantages provided by such resources. Tóth (2015) located the leitmotif between these definitions in the importance specific local resources and territorial assets have, which should be exploited and used to promote territorial development. The territorial capital was further investigated in terms of its components. Camagni (2008) presented a theoretical taxonomy in the form of a complete and consistent structure and combination of territorial assets. Scientific research focused on the following theoretical implications over time: the duality of territorial cohesion and territorial capital (e.g., territorial capital strengthens cohesion at lower levels); the link between territorial capital and regional and urban competitiveness; territorial capital as a bridging concept between cohesion and competitiveness; rural development; territorial governance; the link between territorial capital and innovation; and so on. More recently, territorial capital is often associated with endogenous resources (i.e., social, cultural, and environmental), which generate trajectories of regional and local development (Tóth, 2015).

Alongside the concept of territorial capital, it emerged the relevance of local roots and their influence on people, places, and organisations (Sternad *et al.*, 2017). It suggests a deep connection to the territory from which actors draw inspiration, identity, and sources of competitive advantage (Soderstrom and Weber, 2020). Rediscovering local roots and specific assets, as well as developing new ways of interaction among the economic players and stakeholders, can help firms to design effective and innovative strategies to create and share values (Mair *et al.*, 2016) with positive economic, social, and environmental impacts (Attig and Brockman, 2017).

It is undoubtedly that territorial capital and local roots have economic, social, environmental, and political implications. However, what is still missing is a clear picture of their involvement in the management literature. Therefore, this paper aims to assess state of the art in the current managerial literature, identify the key research blocks emerging from the bibliometric analysis, and deliver recommendations for future research. To contribute to the advancement of management literature, a Structured Literature Review (SLR) was used to synthesise the existing contributions in territorial capital (i.e., values, traditions, culture, history, expertise, etc.) by identifying purpose, main actors, background and peculiarities (Del Vecchio *et al.*, 2021). In particular, Secundo *et al.* (2020) reported that SLR analysis had been successfully adopted in different research fields as 'it helps scholars develop new and interesting research paths by accessing and analysing a considerable volume of scholarly work' (Massaro *et al.*, 2015, 2016; Ribière, and Walter, 2013). This study contributes to the management literature as follows. First, it provides an enhanced understanding of the principal terms used to address this topic. Second, it represents the first bibliometric analysis and systematic review of territorial capital and local roots in management studies. Third, it develops a clear image of the evolution and implications of the subject by detecting its current thematic areas and future directions.

The remaining of the paper is structured as follows. The next section presents the methodology adopted to address the study's aim as well as the data collection methods. The third section relates both the descriptive and thematic analysis of the results, while the fourth section deepens the outcomes by discussing their theoretical and practical implications. Finally, the fifth and last section discusses conclusions, limitations, and recommendations for future research.

2. Methodology

2.1 Search protocol

According to Del Vecchio *et al.* (2021), scholarly research has shown several advantages of using SLR as it represents the most appropriate methodology for categorization/classification, it allows to identify new research areas and domains as well as trends, potentialities and implications for both theory and practice, thus shaping a rigorous future agenda and elucidating the way forward (Grant and Booth, 2009; Vrontis *et al.*, 2021; Vrontis and Christofi, 2021).

Previous studies suggest different approaches and steps to perform a systematic, transparent and replicable SLR study. First, there is the need to establish the research questions (Massaro *et al.*, 2016), which we formulated as follows:

RQ1: *What is territorial capital's state of the art in management research?*

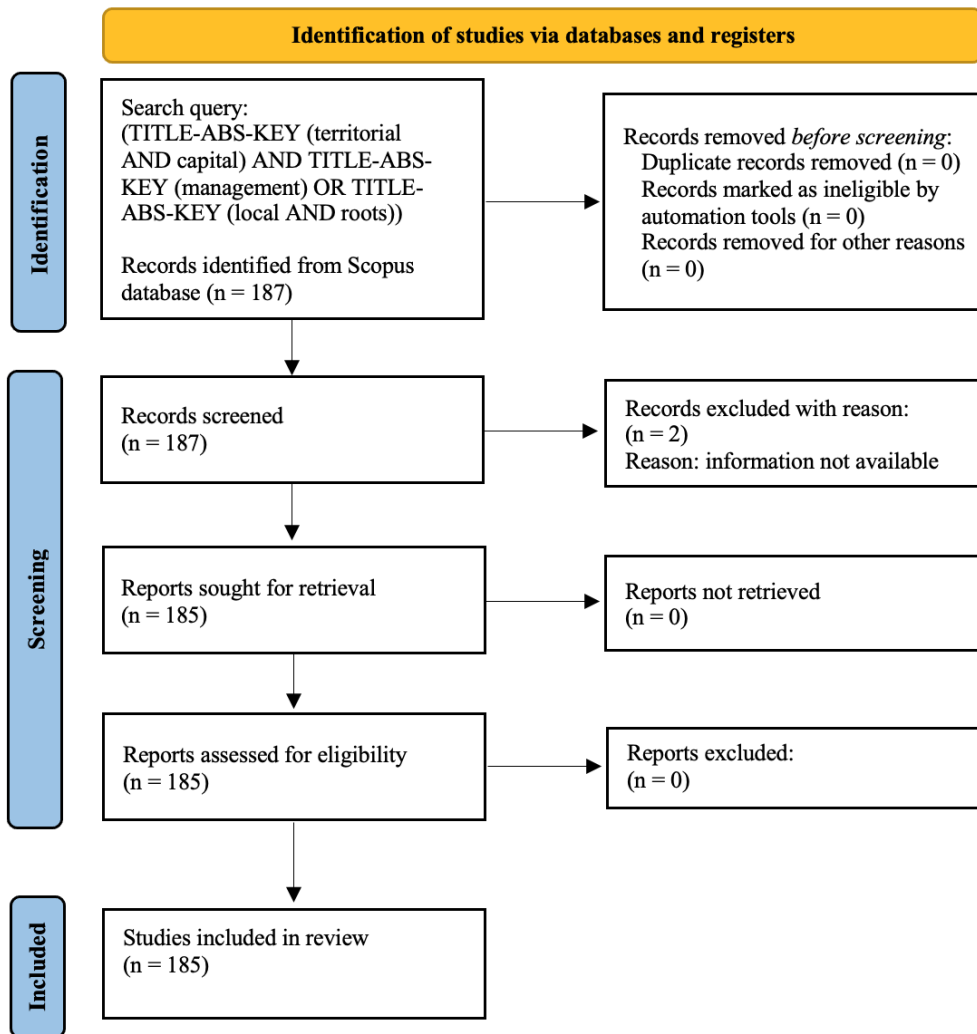
RQ2: *What are the key research blocks related to this subject area?*

RQ3: *What guidelines for future research can be derived to open new avenues for management researchers?*

Specifically, the first research question intends to provide the state of the art in the current literature dealing with this topic and explain to what extent scholars are taking it into consideration. In particular, it aims to understand which channels (authors, articles, journals, institutions and countries) are the most influential, how articles are clustered, and which research streams are likely to emerge in management studies. The second research question aims to identify the key research blocks related to the territorial capital subject area while the third one provides recommendations for future research as well as the identification of possible developments and implications.

Furthermore, Petticrew and Roberts (2008) stressed the need to specify the research protocol used (i.e., which source of information to use, which methods, means and tools to apply for exploring and summarising the studies) (Secundo *et al.*, 2020). For this purpose, inclusion and exclusion criteria were set based on the search string, time framework and boundaries. The articles to be included were retrieved from the Scopus database, which is considered amongst the most comprehensive databases as it provides extensive coverage of academic journals (Snyder, 2019; Yaghmaie and Vanhaverbeke, 2019). According to the PRISMA protocol (Fig. 1), the search process has undergone three steps: identification, screening, and inclusion. To select appropriate papers to include in the study, keywords such as 'territorial capital', 'management' and 'local roots' were considered. As a result, a sample of 446 published articles was retrieved from the Scopus database from 1980-2022. Next, a set of exclusion criteria based on subject area, publication type, stage, and language, was used to reduce and evaluate the sample. In this case, the exclusion criteria led us to a sample of articles published in scientific journals, with the exclusion of books, book chapters, conference proceedings, and articles 'in press'. As for subject area, the sample was limited to the following: 'social sciences' (with 146 documents), 'environmental science' (with 85 documents), 'business, management and accounting' (with 39 documents), and 'economics, econometrics and finance' (with 28 documents). After reading the title, abstract and keywords (Kauppi *et al.*, 2018), articles that were not completed (e.g., abstract or other fundamental information not available) or inconsistent with the research topics were removed, thus resulting in a final sample of 185 published articles.

Fig. 1: Prisma summary of the search process



Source: our elaboration based on the PRISMA flow diagram. Page *et al.* (2021).

2.2 Analytical tools and methods

Since this study aims to provide the state of the art in the current literature dealing with territorial capital in management, data were processed through different bibliometric analysis techniques (Van Eck and Waltman, 2017). Specifically, bibliometric co-citation analysis is a meta-analytical tool that demonstrates interconnections between articles and research topics by analysing the frequency an article is cited by others (Shah *et al.*, 2019). Likewise, bibliometric co-occurrence analysis uses authors' keywords to measure the relatedness of articles on the basis of the number of articles in which they occur together (Eck and Waltman, 2009; Secundo *et al.*, 2020). To assess the relevance of the articles - based on the number of references they share - bibliographic coupling was performed using documents as the unit of analysis. In detail, if documents mainly share the same references, they cluster together (Secundo *et al.*, 2020). Finally, the content analysis presents emerging trends and research gaps as well as future directions. These techniques highlight key research blocks of a topic and allow researchers to clearly understand the phenomenon they want to focus on. Following others' contributions (Del Vecchio *et al.*, 2021; Khan *et al.*, 2020; McAllister *et al.*, 2022; Secundo *et al.*, 2020; Shah *et al.*, 2019; Van Eck and Waltman, 2017), VOSviewer software was used for bibliometric and visual mapping analyses in terms of collaboration and citation links.

2.3 Data analysis procedure

Therefore, the analysis was developed in three stages to answer the research questions and provide an in-depth understanding of the phenomenon under study. First, a descriptive analysis is used to present the publication and citation structure of the sample, as well as the most influential contributions. Then, a cluster analysis and a content analysis were performed using a bibliographic coupling (Kessler, 1963), highlighting exciting research areas. The main findings are presented and discussed in the next section.

3. Research findings

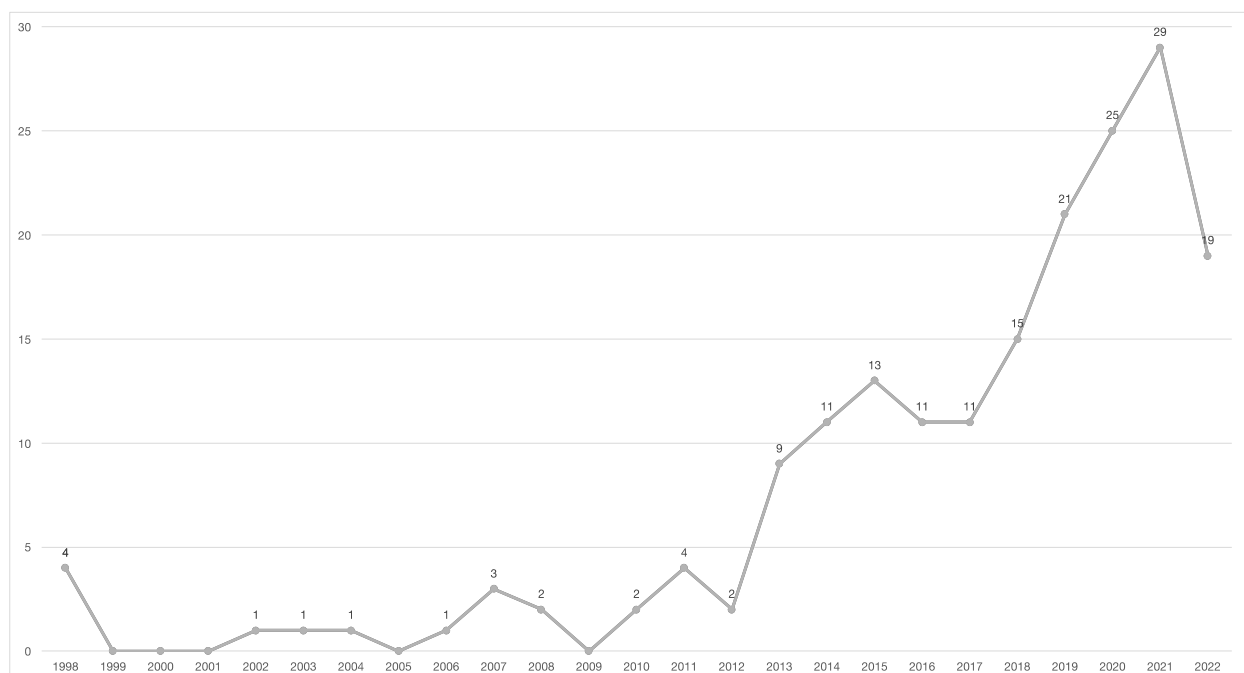
3.1 Descriptive statistics

The descriptive analysis was used to categorise the sample by the number of yearly publications, geographical analysis of authorship and data, number of citations, common keywords as well as the most influential authors.

3.1.1 Articles' evolution in time

Figure 2 displays the distribution of the published articles over the 1998-2022 timeframe. The trend shows that the first four articles date back to 1998, and since then, scholars have published only nine articles in ten years. By contrast, from 2010 onwards, interest in territorial capital studies recovered, and in 2015 there was a peak of 13 articles published. Subsequently, in 2021, a significant contribution, counting 29 scientific publications, was observed, followed by a smaller but still valuable result in 2022 (i.e., 19 documents). These findings demonstrate how the literature began to flourish in recent years, thus confirming the growing topicality of the topic, which needs deep exploration in future studies.

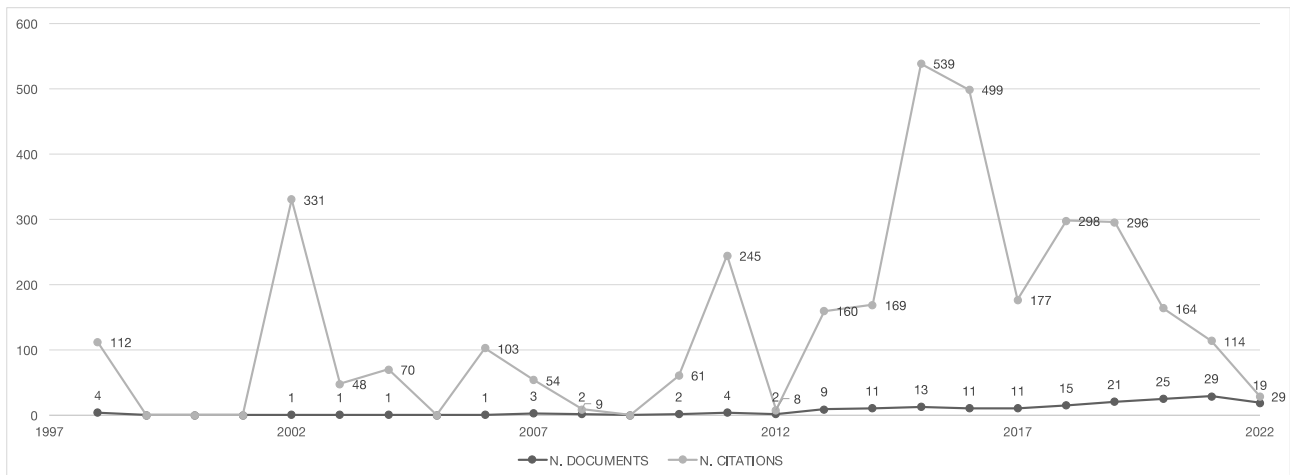
Fig. 2: Trend of publications over the timeframe 1998-2022



Source: Authors' elaboration.

Furthermore, Figure 3 analyses the number of citations received over the years by the articles included in the study sample, compared with the number of published articles during that period. It highlights a peak in 2002 (with 331 citations), followed by a substantial increase from 2013. In particular, various peaks were recorded in 2015 (with 539 citations), 2016 (with 499 citations), 2018 and 2019 (respectively with 298 and 296 citations), while lower values have been recorded in more recent years (e.g., only 29 citations in 2022). This decline could be associated with the shift to more stringent topics - such as the spread and effects of COVID-19 - in literature. Besides this negative result, it should be noted that contributions on territorial capital in management have increased recently and, therefore, their effect may not yet have been fully absorbed by the citations.

Fig. 3: Trend of publications and citations over the timeframe 1998-2022



Source: Authors' elaboration.

3.1.2 Geography of the articles

To analyse the articles' geographical distribution, the number of articles published in the countries, as well as citations, were measured using the fractional counting method. Following Secundo *et al.* (2020), the count considered a country's involvement in the articles' authorship. Specifically, each country received one point if an article was developed with the cooperation of different countries (e.g., universities/research institutions). Table 1 shows that the Russian Federation, Italy, and the United Kingdom rank in the top three positions for the number of published articles, while different considerations arise in terms of citations. Focusing on the number of documents, there is not much difference between the first three countries as they differ from each other by only one paper. The remaining countries are homogeneously distributed in pairs (i.e., Spain and the United States, France and Brazil, Chile and Ukraine), except for China which ranks last with 6 articles published. As for citations, the Russian Federation disappears from the classification, giving first place to the United Kingdom (with 767 citations), followed by Spain (with 674 citations), the United States (with 594 citations), among others. Despite their position, data suggest that half of the countries specialised in such topic belong to the European geographical area. This result could be associated with the greater territorial capital which characterises this region, for its history, territorial attachment, tradition, cultural value, strategic geographic location, and its pivotal role in the genesis of societies.

Tab. 1: Top ten Countries per documents and citations

No.	Country	Documents	No.	Country	Citations
1	Russian Federation	23	1	United Kingdom	767
2	Italy	22	2	Spain	674
3	United Kingdom	21	3	United States	594
4	Spain	19	4	Italy	466
5	United States	19	5	China	317
6	France	11	6	Australia	141
7	Brazil	10	7	Germany	119
8	Chile	7	8	Mexico	116
9	Ukraine	7	9	Chile	106
10	China	6	10	France	95

Source: Authors' elaboration.

3.1.3 Journals

According to Dumay and Cai (2014), where articles are published represents a critical indicator, especially for prospective researchers and authors. Table 2 highlights the top ten journals in which the papers included in the sample were published.

Tab. 2: Top five Scientific Journals

No.	Scientific Journal	Documents
1	Sustainability (Switzerland)	13
2	Land Use Policy	9
3	European Planning Studies	6
4	Cities	4
5	Journal of Rural Studies	4

Source: Authors' elaboration.

So far, the top-ranked journals are Sustainability (Switzerland) (with 13 documents), Land Use Policy (with 9 documents), European Planning Studies (with 6 documents), Cities and Journal of Rural Studies (both with 4 documents). This ranking shows us a high level of heterogeneity, as topics range from business, public policy, urban management, sustainable, local and rural development, with an investigative perspective.

3.1.4 Citations and most influential authors

Table 3 highlights the ten most cited scientific articles from the study sample, showing Wu (2002) as the most influential one, while the publications of Guerrero *et al.* (2015) and Long *et al.* (2006) are in second and third place, respectively. This classification confirms the geographical interest in the topic from the European area mentioned before, being the works of Wu (2002) and Guerrero *et al.* (2015) from the United Kingdom and Spain. Contrarily, the contribution of Long *et al.* (2006) has to be attributed to China. Following previous research using SLRs (Del Vecchio *et al.*, 2021; Massaro *et al.*, 2015, 2016; Secundo *et al.*, 2020), the articles were ranked using citations and citation per year index (CPY). According to Dumay (2014), since recently published articles have not had sufficient time to collect citations, there is a need to normalise citations over time. For this purpose, the CPY index is measured as a ratio of the number of citations divided by the time elapsed between the publication date and the end of the analysis period. This way, it allows researchers to understand the actual importance and contribution of articles to the literature development. As shown in Table 3, Wu (2002) moved from first to fifth position, replaced by Long *et al.* (2016), which took the first place in the CPY ranking. Their article emphasises the role of regional assets - including human, land, and capital resources - in formulating rural development

policy and restructuring rural areas. Next, Guerrero *et al.* (2016) rank second in terms of both citations and CPY (i.e., 235 citations and 36,13 CPY) with a paper highlighting the positive and significant economic impact of entrepreneurial universities' activities in territorial and social capital development. Following, Barbesgaard (2018) won third place in the CPY ranking (i.e., 27,40) by critically interrogating policy proposals addressing environmental and climate change issues as a component of territorial and social capital debate. Finally, although considerable changes, these results confirm the importance of considering the time effect when classifying scientific articles in terms of citations, as it can bring unexpected outcomes to light.

Tab. 3: Top ten author and article per citation and per CPY

No.	Authors	Title	Year	Cited by	CPY	Ranking CPY
1	Wu, F.	China's changing urban governance in the transition towards a more market-oriented economy	2002	331	15,76	5 (↓)
2	Guerrero <i>et al.</i>	Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom	2015	289	36,13	2 (-)
3	Long <i>et al.</i>	The allocation and management of critical resources in rural China under restructuring: Problems and prospects	2016	276	39,43	1 (↑)
4	Corson, C.	Territorialization, enclosure and neoliberalism: non-state influence in struggles over Madagascar's forests	2011	167	13,92	6 (↓)
5	Barbesgaard, M.	Blue growth: savior or ocean grabbing?	2018	137	27,40	3 (↑)
6	Cecchini <i>et al.</i>	Urban sprawl and the 'olive' landscape: Sustainable land management for 'crisis' cities	2019	105	26,25	4 (↑)
7	Sánchez-Zamora <i>et al.</i>	Rural areas face the economic crisis: Analyzing the determinants of successful territorial dynamics	2014	104	11,56	8 (↓)
8	Bray <i>et al.</i>	The Mexican model of community forest management: The role of agrarian policy, forest policy and entrepreneurial organization	2006	103	6,06	10 (↓)
9	Tregear, A., Cooper, S.	Embeddedness, social capital and learning in rural areas: The case of producer cooperatives	2016	95	13,57	7 (↑)
10	Dameri, R.P., Ricciardi, F.	Smart city intellectual capital: an emerging view of territorial systems innovation management	2015	84	10,50	9 (↑)

Source: Authors' elaboration.

3.1.5 Topics and common keywords

Table 4 sets out the analysis of keywords' occurrences authors used to classify their articles as well as to highlight the most important areas in this domain. In particular, keywords are used by authors, editors and publishers to signal key themes in articles, which are then grouped by VOSviewer in terms of their co-occurrence (i.e., the total number of times in which the keywords occur in all documents). Results show five clusters with a total of 37 items, graphically distributed in a network as displayed in Figure 4.

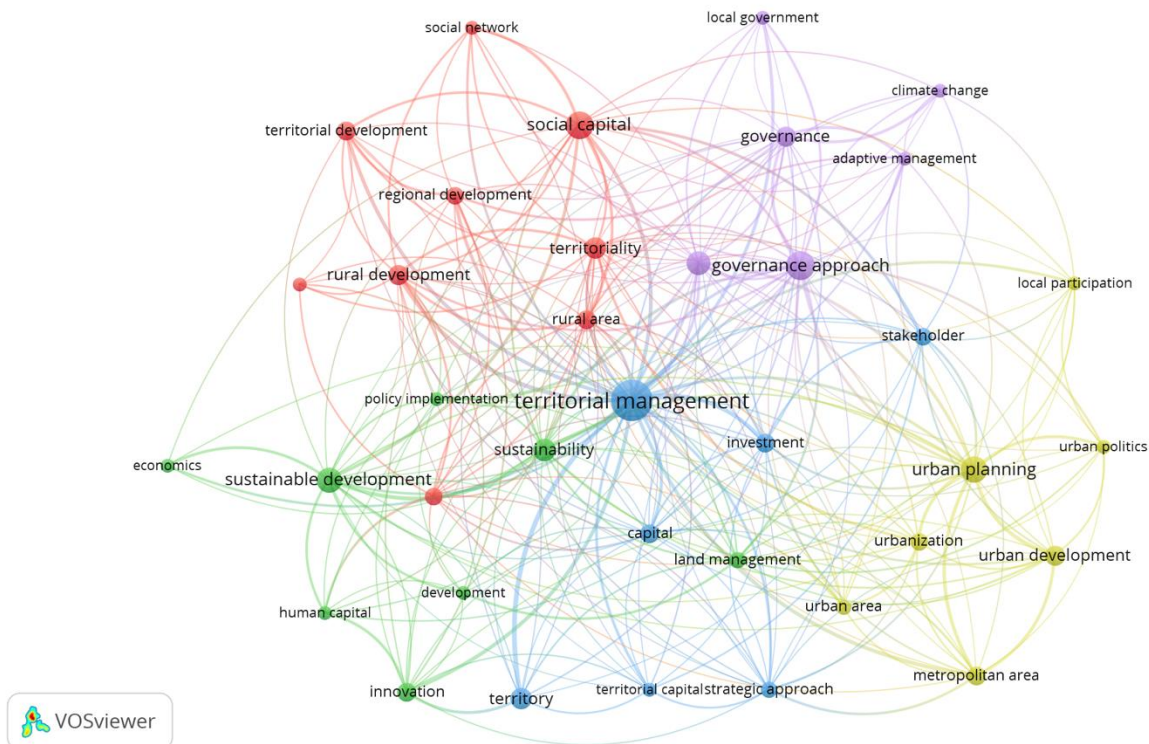
Tab. 4: Title

	<i>Keywords (Occurrences)</i>
Cluster 1 (9 items - red)	Globalization (8), Natural capital (5), Regional development (8), Rural area (10), Rural development (11), Social capital (20), Social network (5), Territorial development (10), Territoriality (12)
Cluster 2 (8 items - green)	Development (5), Economics (5), Human capital (5), Innovation (9), Land management (7), Policy implementation (5), Sustainability (13), Sustainable development (17)
Cluster 3 (7 items - royal blue)	Capital (9), Investment (10), Stakeholder (8), Strategic approach (7), Territorial capital (5), Territorial management (44), Territory (12)
Cluster 4 (7 items - yellow)	Local participation (5), Metropolitan area (10), Urban area (6), Urban development (11), Urban planning (18), Urban politics (5), Urbanization (8)
Cluster 5 (6 items - lavender)	Adaptive management (5), Climate change (5), Governance (11), Governance approach (21), Local government (5), Territorial planning (15)

Source: Authors' elaboration.

Specifically, the most frequent keyword was 'territorial management' (with 44 occurrences - cluster 3), followed by 'governance approach' (with 21 occurrences - cluster 5) and 'social capital' (with 20 occurrences - cluster 1), 'urban planning' (with 18 occurrences - cluster 4) and 'sustainable development' (with 17 occurrences - cluster 2), among others. As shown in Figure 3, although they are placed in different clusters, they have links: they occur together but lesser than 3 times.

Fig. 4: Keywords network visualisation



Source: Authors' elaboration using VOSviewer.

3.2 Clustering and content analysis

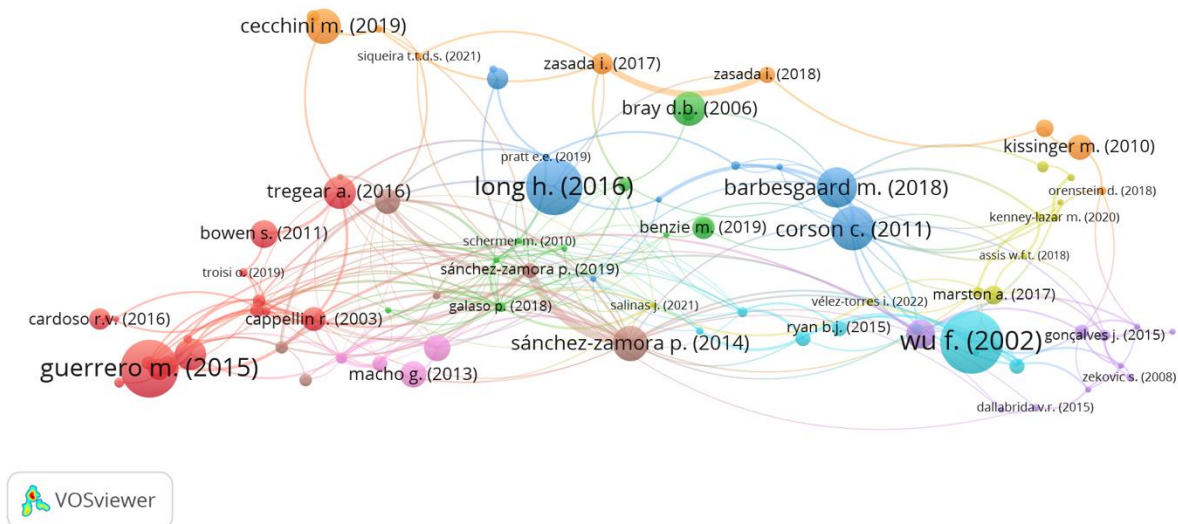
3.2.1 Clustering analysis

A cluster analysis using bibliographic coupling (Kessler, 1963) was then performed using the references included in each paper of the sample. In particular, the bibliographic link (i.e., the

relatedness between two articles that both cite the same documents) was evaluated through VOSviewer by considering papers that mainly share the same references (Boyack and Klavans, 2010; Del Vecchio *et al.*, 2021). The analysis, which included only papers having two references in common at the minimum, gave us nine clusters with 87 related items.

Figure 5 displays the clusters arising from the bibliographic coupling analysis after running 10 interactions, showing the strength of the closeness according to the number of references in each paper (Del Vecchio *et al.*, 2021). Although articles of the same cluster belong to common research areas, the cluster analysis performed using VOSviewer is not without imperfections. Actually, a better representation of the research areas discussed in the literature is illustrated in Table 5. Here, authors are classified according to the content of the study and their focus, which extends beyond the evidence indicated by the bibliographic coupling analysis. These subject areas are further discussed in detail in the next section.

Fig. 5: Bibliographic coupling: cluster grouping items with intersected literature



Source: Authors' elaboration using VOSviewer.

3.2.2 Content analysis

A deep content analysis was performed by reading the 87 papers to understand the top research areas. A content analysis was performed by each researcher individually, allowing a better classification of the documents besides the identification of the main research blocks. Then, a discussion followed, leading to a reclassification of the nine clusters into more homogeneous groups. Ultimately, the nine clusters were identified as: (1) Territorial capital: knowledge, innovation, and embeddedness, (2) Territorial policies and social capital to achieve community development and sustainability, (3) Territorial risk management policies, (4) Territorial capital in production and practices, (5) Territorial planning and urban governance, (6) Territorial value in global markets, (7) Territorial sustainability: resources efficiency and management, (8) Territorial governance and resilience, and (9) Social capital and Territorial User Rights (TUR) systems (Tab. 5).

Tab. 5: Title

Research area	Authors
1 Territorial capital: knowledge, innovation, and embeddedness (18 items - red)	Bowen (2011), Cappellin (2003), Cardoso and Meijers (2016), Dameri and Ricciardi (2015), de Fátima Ferreiro and Sousa (2019), Del Baldo (2013), Di Berardino and Corsi (2018), Festa <i>et al.</i> (2020), Friedmann (1998), Guerrero <i>et al.</i> (2015), Héraud (2021), Hervas-Oliver and Dalmau-Porta (2007), Rodríguez-Cohard <i>et al.</i> (2020), Rodríguez-Pose and Wilkie (2019), Szmytkowska <i>et al.</i> (2021), Tovma <i>et al.</i> (2020), Tregear and Cooper (2016), Troisi <i>et al.</i> (2019).
2 Territorial policies and social capital to achieve community development and sustainability (12 items - green)	Benzie and Persson (2019), Bray <i>et al.</i> (2006), Cilona (2017), Galaso (2018), Gustavsson <i>et al.</i> (2017), Jørgensen <i>et al.</i> (2021), Malý <i>et al.</i> (2021), Nespov and Voithofer (2016), Peña <i>et al.</i> (2017), Roncoli <i>et al.</i> (2007), Salinas and Sastre-Merino (2021), Schermer <i>et al.</i> (2010).
3 Territorial risk management policies (14 items - royal blue)	Alvarez and Cardenas (2019), Barbesgaard (2018), Chiang <i>et al.</i> (2021), Corson (2011), Ganseforth (2021), Glenn (2014), Jensen <i>et al.</i> (2021), Long <i>et al.</i> (2016), Polishchuk <i>et al.</i> (2021), Pratt and Warner (2019), Ryan (2015), Su and Cai (2020), Valenzuela-Fuentes <i>et al.</i> (2021), Vélez-Torres <i>et al.</i> (2022).
4 Territorial capital in production and practices (10 items - yellow)	Assis and Franco (2018), Bertoncin <i>et al.</i> (2019), Hartmann <i>et al.</i> (2021), Kenney-Lazar (2020), Levidow <i>et al.</i> (2021), Lubbock (2020), Marston and Perreault (2017), Mendez <i>et al.</i> (2020), Reina-Usuga <i>et al.</i> (2022), Zekovic and Vujosevic (2008).
5 Territorial planning and urban governance (10 items - lavender)	Dallabrida (2015), de Carvalho and Corso-Pereira (2013), Gonçalves and Ferreira (2015), Mazzola <i>et al.</i> (2019), Peric and D'hondt (2022), Prada-Trigo (2017), Robinson and Attuyer (2021), Shih (2019), While <i>et al.</i> (2004), Wu (2002).
6 Territorial value in global markets (5 items - cyan)	Antonsich and Holland (2014), Chandrashekeran (2016), Clark <i>et al.</i> (2021), Fialová and Vágner (2014), Jiang and Waley (2020).
7 Territorial sustainability: resources efficiency and management (9 items - orange)	Bianchi <i>et al.</i> (2020), Cecchini <i>et al.</i> (2019), Kissinger and Rees (2010), Muñoz-Rojas <i>et al.</i> (2019), Orenstein (2018), Salvati <i>et al.</i> (2016), Siqueira <i>et al.</i> (2021), Zasada <i>et al.</i> (2017), Zasada <i>et al.</i> (2018).
8 Territorial governance and resilience (5 items - brown)	Cheshire <i>et al.</i> (2015), Coudel <i>et al.</i> (2008), Ricciardelli <i>et al.</i> (2018), Sánchez-Zamora <i>et al.</i> (2014); Sánchez-Zamora <i>et al.</i> (2019).
9 Social capital and Territorial User Rights (TUR) systems (4 items - pink)	Crona <i>et al.</i> (2017), Macho <i>et al.</i> (2013), Mertens <i>et al.</i> (2011), Rosas <i>et al.</i> (2014).

Source: Authors' elaboration.

The thematic areas are discussed more thoroughly as follows:

1. Territorial capital: knowledge, innovation, and embeddedness

In this first group, authors mainly examined the territorial capital through the importance of place. Here, it has a threefold expression: territorial knowledge, innovation management, and embeddedness. In detail, territorial knowledge management aims to overcome cognitive barriers by converting tacit and localised knowledge into explicit information available to everyone (Cappellin, 2003). As territorial knowledge emerges as a unique competitive factor - because it is a component of local structural capital and global reputational capital - territorial strategies should then be used to assess competitiveness and boost regional development based on its peculiarities (i.e., social capital, historical, cultural and cognitive elements) (Bowen, 2011; Festa *et al.*, 2020; Rodríguez-Pose and Wilkie, 2019; Tvoma *et al.*, 2020). To succeed in this goal, it is important to capitalise on such characteristics and establish dynamic management practices -

which co-evolve with the environment - by applying innovation and new competencies (Del Baldo, 2013). Therefore, the need to favour embeddedness and social capital through collaborations, knowledge exchange and learning among institutions (i.e., firms, universities, local governments, citizens, etc.), leading to a territorial ecosystem in which local actors play an active role in governance (Tregear and Cooper, 2016). Of course, the urban structure and the territorial vocation to sustainability should also be considered (Friedmann, 1998).

2. *Territorial policies and social capital to achieve community development and sustainability*

This cluster delves into strategies to deliver social, economic and ecological benefits and local development through community engagement in supporting social initiatives and policies (Bray *et al.* 2006). According to Ciona (2017), citizen participation is fundamental to developing and backing sustainability policies and mobilising collective efficacy in territorial development (Jørgensen *et al.*, 2021; Malý *et al.*, 2021). These topics are of fundamental importance in today's everchanging scenario as they help to cope with global crisis, secure competitiveness and growth. Therefore, the need for flexible social participation, social capital formation, management and coordination (Schermer *et al.*, 2010), besides conflict management strategies (Roncoli *et al.*, 2007).

3. *Territorial risk management policies*

This cluster focuses on strategies and practices to minimise those risks that may interfere with territorial development. Among others, authors investigated political (Alvarez and Cardenas, 2019; Chiang *et al.*, 2021; Glenn, 2014; Vélez-Torres *et al.*, 2022), social (Jensen *et al.*, 2021), economic (Corson, 2011; Ganseforth, 2021), and environmental (Barbesgaard, 2018; Long *et al.*, 2016) risks associated with local areas. They underlined the need for accurate policies and collective actions to manage resource efficiency (i.e., human, land, and capital) and rural development, lowering eventual crisis consequences. As for the social face of the problem, Jensen *et al.* (2021) propose strategies using a range of socially patterned responses to combine social capital and awareness of public problems (Polishchuk *et al.*, 2021), while Pratt and Warner (2019) highlight the role of local social capital and regional territorial dynamics to support economic growth.

4. *Territorial capital in production and practices*

This group of scientific articles spotlights the centrality of the exploitation of natural resources in production and practices as well as territorial tools to attract capital flows in the local value chain (Bertoncin *et al.*, 2019; Hartmann *et al.*, 2021). In particular, authors studied these attributes in the agri-food (Assis and Franco, 2018; Kenney-Lazar, 2020; Levidow *et al.*, 2021) and mining (Marston and Perreault, 2017) systems, emphasising the need to preserve resources (e.g., tangible and intangible), establish cooperative forms of governance (Lubbock, 2020) and adopt a more strategic development approach (Zekovic and Vujosevic, 2008).

5. *Territorial planning and urban governance*

Key themes emerging from this cluster are territorial planning systems, infrastructure, and urban design. Dallabrida (2015) defined territorial planning as a process of social dialogue and decision-making - involving several actors - aimed at determining the territorial future structure and development. It clearly represents a strategic tool to promote local dynamism and flexibility, allow the convergence of private and public actors through Public-Private-Partnerships (PPPs), and adjust to situations (Gonçalves and Ferreira, 2015; Mazzola *et al.*, 2019).

6. *Territorial value in global markets*

This cluster introduces the importance of territoriality when competing in global markets. Indeed, the integration of markets and the presence of global communication led to the creation of a territorial attachment, defined by Antonsich and Holland (2014) as the territorial identity

associated with places (e.g., local, regional, national). This attachment is characterised by a complex formation, as it can derive from a personal or social context and can be triggered by a multitude of factors (i.e., culture, values, history, human interactions, social networks, and so on) (Fialová and Vágner, 2014). Therefore, the need to analyse it from a multidimensional perspective, especially in a global scenario (Chandrashekeran, 2016).

7. *Territorial sustainability: resources efficiency and management*

Several authors pointed out the importance of resource efficiency and sustainable land management from a territorial perspective. This cluster introduces eco-efficiency indicators as instruments supporting policy decisions geared at sustainability. It affirms its importance in encouraging the efficient use and conservation of productive factors, biodiversity, and local traditions within each region and implementing place-based policies (Bianchi *et al.*, 2020; Cecchini *et al.*, 2019; Kissinger and Rees, 2010). Indeed, countries are rich in traditional rural and peri-urban landscapes hosting valuable biodiversity and bearing multiple social and cultural values (Muñoz-Rojas *et al.*, 2019). Therefore, the need to manage properly such treasures through efficient landscape policies, measure ESG performance, and meet the sustainability goal (Salvati *et al.*, 2016; Siqueira *et al.*, 2021; Zasada *et al.*, 2017, 2018).

8. *Territorial governance and resilience*

This set of scientific papers address the topics of community resilience, social capital and territorial governance. The community resilience is introduced by Cheshire *et al.* (2015) as the response to the risks and changes that rural region face. To overcome such obstacles, it is important the involvement of new competencies forming human, social and institutional capital (Coudel *et al.*, 2008), which enable local actors to play an active role in governance. As a result, decentralised public policies bring in resilience at both community, territorial, and governance level (Ricciardelli *et al.*, 2018; Sánchez-Zamora *et al.*, 2014, 2019), fostering economic recovery and an active community engagement.

9. *Social capital and Territorial User Rights (TUR) systems*

The last cluster examines the link between social capital and Territorial User Rights (TUR) systems, which promote the enhancement of environmental sustainability in production processes by avoiding the overexploitation of natural resources (Macho *et al.*, 2013). Although its remarkable purpose, TURs also need to consider the social consequences and determinants of success (Crona *et al.*, 2017). Therefore, the role of social capital in TURs is investigated. Mertens *et al.* (2011) and Rosas *et al.* (2014) tested the effect of social capital on the economic performance of TUR systems through the social network approach. They concluded that bonding relationships are significant economic performance determinants and may contribute to territorial development and capital. Furthermore, policies oriented at training and promoting collaborations between actors are fundamental to spread achieve higher social capital levels.

4. Discussion

This study provides theoretical implications for scholarly research from a multi-disciplinary perspective. In addition, the results of the SLR allowed us to better understand the meaning and implications of territorial capital and local roots by exploring actual and potential applications in the management research field. In particular, our results underline that research has been flourishing in recent years as regards the number of documents and citations. This data gives us a clue about the topicality of this theme, aimed at rediscovering the roots, culture, traditions, and history of a territorial. This trend could have been influenced by the outbreak of COVID-19 virus, which led people to search for values and realign priorities to those recalling rural habits and naturalness, especially from the youngest. Regarding the origin of the contributions, the European geographical

area represents the most active in this field, probably due to its history, territorial attachment, tradition, cultural value, strategic geographic location, and its pivotal role in the genesis of societies. Furthermore, the analysis outlines that ‘territorial capital’ is often associated with the ‘social capital’ dimension. It emerged as the third most frequent keyword occurrence - outperforming territorial capital - and it is part of several bibliographic coupling clusters. This outcome may open to further examinations, since attention to social aspects is gaining interest in recent years in different contexts. The bibliographic coupling outcomes also confirm the multidisciplinary interest in ‘territorial capital’ extensions. Indeed, it addresses knowledge management, innovation, regional development, risk management territorial policies, competitiveness, sustainability, urban planning and governance. Despite its relevance and increasing interest, research in this area still needs to be expanded beyond a few fields of study. Therefore, future research should examine how to exploit such a versatile aspect.

Moreover, this study offers practical implications mainly related to the exploitation of territorial capital. On the one hand, territorial capital can be pivotal in defining strategies to promote a brand or a company by communicating the territorial characteristics (i.e., values, traditions, culture, history, manufacturing expertise, etc.). On the other hand, some specific attributes can be part of a tourism development strategy aimed at rediscovering local roots and promoting a slow tourism offer. Both these orientations offer opportunities for local development, economic growth, sustainable and social benefits.

5. Conclusions and future research directions

In conclusion, this study answered the three research questions by revealing strings underneath territorial capital and local roots applications in management. It cleared the nature of contribution in this topic, defined the research area in which it develops, and delineated theoretical and practical implications. Results confirm that implementing territorial capital strategies benefits governments, organisations and end users. However, the effectiveness of such strategies is subject to specific prerequisites, stakeholders, mechanisms, methodologies and methods that an integrative framework could unveil and support. The paper also contributes to understanding the social impact of rediscovering traditions and local destinations through value propositions that leverage cultural knowledge and heritage. Although challenging, these issues assume a topical dimension in defining firm and regional strategies.

As is common in academic research, this study is not without limitations that require further attention. First, the study sample includes research works published in well-known academic outlets included in the Scopus database following specific inclusion criteria. Although the data collection and SLR protocol were comprehensive and rigorous, such restrictions may result in omitting literature on the topic under study (Vrontis and Christofi, 2021). To cope with this limitation and further restrict bias errors, a comprehensive reference check was conducted. Second, as the research topic range on the different faces of territorial capital, the analysis results to be complex but characterised by a great application potential. Therefore, the need to define a research agenda to cover all the peculiar elements emerging from the analysis.

Scholars should extend this study by identifying additional literature, considering publications we excluded from the study sample (e.g., article ‘in press’, conference proceeding, editorials, papers from other subject area), which equally discuss the topic under study. Furthermore, future research may investigate the phenomenon from the user’s perspective. Indeed, we suggest to practically test the territorial capital value considering consumers and tourists’ opinion about strategies based on territorial characteristics’ recalls. In addition, future research may also investigate the role of territorial policies in promotion and management as well as relationships among the actors of the value chain.

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Intangibles, technologies, and logistics resilience. Preliminary findings from the Pharmaceutical and Automotive sectors

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Abstract

Framing of the research. *This research contributes to the debate on supply chain and logistics resilience by exploring the opinions of managers working in the automotive and pharmaceutical sectors about the importance of intellectual capital and technologies to achieve resilience.*

Purpose of the paper. *The paper aims to shed light on the main concerns of automotive and pharmaceutical supply chain managers that are in charge for the logistics operations with specific regard to the role of intellectual capital and advanced digital technologies.*

Methodology. *To address the research objective, an inductive and exploratory analysis has been conducted through qualitative in-depth interviews (n=12). Data was analyzed by undertaking a qualitative thematic content analysis.*

Results. *Findings showed that managers do believe in the valuable contribution of intellectual capital elements and technologies for achieve resilience. However, many barriers remain in the adoption of such technologies and in recognizing the contribution of intangible elements. Therefore, an important cultural change is needed.*

Research limitations. *The main limitation of the research is related to the qualitative method used and to the context of investigation. In fact, qualitative methods do not ensure the generalizability of results and our analysis is based on interviews made to managers based in Italy.*

Managerial implications. *In an era in which globally disruptive events have substantially reshaped the world in which we live, understanding the contribution of intangible elements, in addition to the tangible ones, and of technologies is of primary interest for managers of long and dispersed global supply chains.*

Originality of the paper. *To the best of our knowledge, this study is among the first that investigate the contribution of intellectual capital and of specific advance technologies for achieving logistics resilience, while other studies focused more on the resilience of the overall end-to-end supply chain.*

Key words: *logistics resilience; intellectual capital; intangibles; technologies; automotive; pharmaceutical*

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1. Introduction and rationale of the research

In the last three years, the term “resilience” has become a buzzword for supply chain managers and a new strategic imperative for global value chains (Dolgui and Ivanov, 2020; Ivanov and Das, 2020). In its simplest conceptualization, supply chain resilience (SCR) is related to the ability of a supply chain to respond to unexpected disruptions effectively and efficiently and to recover in a timely manner (Hohenstein *et al.*, 2015; Kamalahmadi and Parast, 2016; Tukamuhabwa *et al.*, 2015). Borrowing this definition, to date several scholars addressed the topic of SCR in different industries (Chenarides *et al.*, 2021; Ding, 2018; Faggioni *et al.*, 2023; Singh *et al.*, 2016), but there is a paucity of research regarding the “core” element of a supply chain, i.e., the logistics. In fact, as remarked by Walters (2007, p. 43), “*There are essentially two types of decision about a supply chain. The first is largely strategic and designs the best structure for a chain. The second is about execution and finds the most efficient ways of moving materials through the chain [i.e., logistics]*”. Whereas research has extensively explored the resilience of this topic within the strategic side (Ivanov and Das, 2020; Chowdhury *et al.*, 2021), less is known about the executional side (i.e., the logistics one) (Verschuura *et al.*, 2020).

While many studies tried to explore this research area by focusing on tangible resources and on technical aspects of a firm (Ali *et al.*, 2021; Emenike and Falcone, 2020; Queiroz *et al.*, 2022), to the best of our knowledge there is a gap considering the combined contribution that intangibles and advanced digital technologies can give to the resilience of the executional side of a supply chain.

As such, this paper addresses this gap by focusing on two specific sectors that have been most impacted by recent global disruptions such as COVID-19 pandemic and the Russia-Ukraine war, i.e., the Automotive and Pharmaceutical sectors (Faggioni *et al.*, 2023; Hoeft, 2021). The goal of this research is to provide new insights about intangibles and technologies for resilience of the executional side of a supply chain and to examine the following research question: “What are the opinions of supply chain managers - with regard to the executional side of supply chain - about the role of intangibles and new advanced digital technologies in achieving higher degree of resilience?”.

In this paper, considering the paucity of previous research, we chose a qualitative, inductive, and exploratory method of research that is useful to make new and valuable insights about a topic that has been less investigated by extant literature. Specifically, we conducted a total of 12 interviews (six for each sector) to managers of supply chains that are directly involved in the logistic division of each supply chain. We believe that this study may contribute to both strategic and operational tasks of managers of these sectors by uncovering what’s beneath the role of intangibles and of advanced digital technologies for logistic divisions.

The remainder of the paper is organized as follows. In the next two paragraphs, we briefly discussed the relevant literature and the chosen method of investigation. In the fourth and fifth paragraphs, findings are reported along with conclusion, limitations, and future research avenues.

2. Brief theoretical overview

To overcome disruptions, supply chains need to be resilient and able to establish valuable methods in order to predict and manage future risks (Massaroni *et al.*, 2015; Gölgeci *et al.*, 2019), also adopting advanced digital technologies and platforms (e.g., control towers - Patsavellas *et al.*, 2021). The main issue in defining resilience is related to the fact that it is a context-depending concept (Azadegan *et al.*, 2019). In addition, it is multifaceted, i.e., it depends on the interplay that specific economic actors established in a given supply chain relationship (Mehralian *et al.*, 2015).

As a result, the number of perspectives that can be used to identify what resilience is created a number of criticalities both to academics and managers (Goldsby *et al.*, 2019). To date, research made huge efforts in finding specific characteristics on which to base the concept of resilience (Hohenstein *et al.*, 2015).

Among others, current literature recognized that resilience involved the following elements: 1) Readiness, 2) Response, 3) Recovery, and 4) Growth. Readiness is about the organization's ability to deal with unexpected risks of disruptions (that is, before disruptions occur). On the other hand, response is related to the organization's capability to overcome disruptions during the manifestation of their effects. Finally, recovery and growth indicate, respectively, the time an organization needs to overcome the impact of disruptions (after the disruption) and the ability of the focal organization to return to the original state or to gain a new and more desirable state after being disrupted (Azadegan *et al.*, 2019; Chowdhury and Quaddus, 2017; Chowdhury *et al.*, 2021).

In addition to the aforementioned Tukamuhabwa *et al.* (2015) definition of resilience, another comprehensive definition is the one provided by Hohenstein *et al.* (2015, p. 108), that describe resilience as the “ability to be prepared for unexpected risk events, responding and recovering quickly to potential disruptions to return to its original situation or grow by moving to a new, more desirable state to increase customer service, market share and financial performance”. Therefore, the two definitions illustrate how important the four phases of resilience are in terms of costs minimization and to increase market share and financial performance (thus enhancing the competitive advantage).

However, to date many aspects of resilience remain problematic. For instance, current literature expressed resilience as an ability that relates to its ability of achieving a new, better competitive advantage after a disruption occurs, but very few papers take into account what are the main elements that make it possible (Mubarik *et al.*, 2022). This is especially true when taking into consideration the intangible elements and therefore the intellectual capital (Dumay *et al.*, 2020). The latter is usually split by literature into three sub-components, namely human capital, structural capital, relational capital (Mubarik *et al.*, 2022; Rossi and Magni, 2017). Human capital is the set of knowledge, skills, and capabilities of employees, which play an essential role in terms of value creation (Sullivan and Sullivan, 2000). Structural capital is related to the knowledge embedded in organizational routines and processes (Ahmed *et al.*, 2019; Mubarik *et al.*, 2019). Finally, relational capital is related to the ability on which the organization creates relationship with its stakeholders (Ahmed *et al.*, 2019).

In a world that is moving towards a new, sustainable, and digital-aided configuration such as the model of Society 5.0 (Konno and Schillaci, 2021), advanced digital technologies play a critical role in ensuring a sustainable and resilience model for logistics (Aslam *et al.*, 2020). Among others, artificial intelligence seems to be the most valuable in terms of value creation for resilience, as it “is capable of developing the right products by extracting customer expectations at a faster rate, sensing the market, using failure modes, optimizing internal and external supply chains and engaging the workforce to become creative by automating business processes” (Modgil *et al.*, 2021, p. 133). On the other hand, other technologies, such as blockchain technology (Min, 2019), digital twins (Bhandal *et al.*, 2022) also play a critical role in enhancing resilience for supply chains (Pettit *et al.*, 2019; van Hoek, 2019; 2020).

Combining both the critical elements of resilience (i.e., the role of intangibles and technologies) recent literature about supply chain risk management and SCR recognized that it is crucial to distinguish their potentials and implications, especially in terms of adoption of such elements and of identification of the best business opportunity (van Hoek, 2019). Specifically, in case of long and dispersed supply chain networks, it is challenging to overcome intra- and inter-organizational barriers to the understanding of such potentials (Faggioni *et al.*, 2023). For instance, financial and knowledge barriers created several criticalities to both focal organizations and supply chains to adopt correct technologies and to invest in the right tangible and intangible assets to gain resilience (Ali and Gölgeci, 2019).

Nonetheless, recent call for research widely aware scholars and managers that today it still remains a broad scope to further investigate the role of such technologies and of intellectual capital elements in order to enhance resilience from both strategic and executional perspectives (Chowdhury *et al.*, 2021). To decrease the complexity of achieving higher and long-lasting levels of resilience, authors suggest to focus on specific divisions and functions of a supply chain, implying

that understanding in which way resilience can be obtained in such divisions can also explain the dynamic of the overall resilience of a end-to-end supply chain (Song *et al.*, 2022).

Therefore, this research aims to delve into the complexity of such relationships between end-to-end supply chain and specific functions/divisions by investigating the point of view of those who are committed everyday in taking decisions about the resilience in a specific division, namely the logistics.

3. Methodology

Given our RQ, a qualitative, inductive, and exploratory is the most appropriate method to gain valuable insights (Armstrong, 1979). Adopting such a research method, we want to avoid any researcher biases that may result in a conditioning for respondents. Semi-structured in-depth interviews have been performed as they allow an open-ended interaction between the interviewer and interviewees (McCracken, 1988; Schreier, 2012). A thematic content analysis of the interviews has been undertaken (Braun and Clarke, 2006). An interview guide has been developed by researchers. The guide has been sent to the invited participants (managers of supply chains in automotive and pharmaceutical sectors) to obtain their full collaboration and availability to contribute to the research aims. Each interview has been transcribed in full and has been performed mostly via VoIP systems because of the different locations of each interviewee. Each interview lasted between 20 and 30 minutes. Moreover, in order to achieve an effective data saturation, the approach of Boddy (2016, p. 429), that suggested that “data saturation starting to become evident at six in-depth interviews and definitely evident at 12 in-depth interviews among a sample” has been followed. As such, 12 managers of global supply chains that are fully experienced in logistics activities have been interviewed. Our respondents are in line with the definition of *key informants* (Marshall, 1996) and each respondent has been codified as follows “Initial of Industry_number of interview” (e.g., A1, P1 etc.).

4. Preliminary findings

Respondents stated that they are aware that the issue of resilience is absolutely fundamental for dealing with the future shocks of disruptive magnitude.

Findings showed that managers of both sectors believe that intangibles and advanced digital technologies are crucial in order to achieve resilience. With regard to intellectual capital elements, some respondents reported that the intellectual capital elements are more critical than technologies. For those respondents, technologies are now very accessible and therefore they do not constitute a concrete problem for many large organizations. Instead, the ability of the organization to establish an adequate organizational culture, know-how, and capabilities that recognized intangibles as a competitive asset is very important. In essence, it is not enough to spend to access technology, the important thing is that the company has internalized these technological variables within its intellectual capital; therefore, a huge organizational culture change is needed nowadays:

“The intellectual capital is very important. In particular, considering the recent events of both pandemics and wars, intellectual capital plays an important role in my opinion. For example, my company was very impacted by the so-called “Chip Shortage”, and one major change we made was to engage the customer earlier and better with us and our semiconductor suppliers in advanced planning, to reserve capacity up to two years in advance. We're doing it with the tools we already had at our disposal, but with a more focused organization.” (A2)

“Especially during COVID, but also today that the pandemic is behind our back, I feel that people in my organization is more than ever important if compared to technology. We invested a lot

in our human capital and on the intellectual capital more in general and this is the most valuable investment ever. If I have many efficient technologies that do not communicate with people working in my organization, it is simply useless” (P6)

On the other hand, other respondents claimed that their logistic divisions in both sectors have invested and will have to invest in technology. According to them, in an increasingly digital world, those who do not develop advanced technologies will have difficulty gaining market share and resilience. Many of them recalled the emerging of e-commerce market and how it has developed in recent years, totally changing the concept of logistics. Consistently with this perspective, respondents stated that a major investment that each logistics operator would need is in process automation. Process automation is crucial in order to provide the best service to the end customer, and without being sustained by appropriate technologies it wouldn't be possible to achieve higher level of resilience. In terms of technology, one of the respondents stated that:

“The combination of our control tower and ERPs have been at the core of our resiliency. Nonetheless, in our organization we have understand that these technological tools are enablers. Of course, they are important enablers... but they still remain enablers! Instead, the intellectual capital of our organization is the core ability that allow us to be resilient. I have no doubt about it.” (P2)

“It is all about technology and about the ability of people in dealing with it, according to me. Our resilience has been in trusting our employees in the past as well as today. In fact, for years we have been activating internal training programs that tend to have the aim of transforming simple employees and vehicle drivers into real logistics managers able to use very complex technologies.” (A3)

Narrowing the perspective, i.e., focusing on specific issues related to the logistics of their supply chains, respondents claimed that logistics will play a new, decisive role in the short run given the recent global shocks that affected it. Specifically, a new organizational configuration of logistics should be strictly influenced by a huge organizational change devoted to the understanding of a new role of this function and of the interplay between intangibles elements and related technologies.

“Undoubtedly, recent events gave us important lessons. Logistics was always seen in my company as a technical function in which efficiency is the most important aspect, somewhat distinguished by the strategic implication that indeed it has. Today it is clear that logistics is no longer just about having correct and efficient materials handling, but it is also about relationships among partners, that is something historically related to the corporate aspect of the overall supply chain” (P4)

“Our logistic operations are now more than just that. Instead, they are proactive and predictive technology-driven operations in which humans and technologies are at the center. As such, this requires a huge shift in the organizational culture and in decision making. In my division we are reflecting about how to invest in our human, relational and structural capital and to invest in technologies that are the most correct enablers in order to exploit value and resilience. We are still at the starting point, but this is for sure the right track” (A1)

5. Conclusion, limitations, and future research

In a world in which COVID-19 pandemic and Russia-Ukraine war are still underway, resilience has become the new strategic imperative for supply chains. Our investigation revealed that combining technologies and intangible (intellectual capital) elements is crucial in order to become

resilient and to respond to uncertainty. Although we obtained just preliminary findings, by analyzing the relationship between intellectual capital, technologies, and logistics resilience, we make some contributions to both research and practice.

For instance, although various previous studies have highlighted that that logistics capabilities are antecedent to SCR (Ponomarov and Holcomb, 2009; Ivanov and Das, 2020), they have not systematically explained what are the main elements that connect the two. To address this literature gap, the current study adopts the lenses of intellectual capital and advance digital technologies as elements that can be key enabling factors of logistics resilience (Mwesiumo *et al.*, 2021; Novak *et al.*, 2021). Furthermore, this study provides an in-depth qualitative analysis of the managers' opinions about the two topics, showing that there isn't a unanimous consensus about what contributes the most to resilience. In fact, some of the interviewees believe that technologies are more important than intangibles for achieve resilience in the executional side of their supply chains, while others consider technologies important enablers that should be guided by the intellectual capital elements (Modgil *et al.*, 2021; Mubarik *et al.*, 2022). However, both perspectives recognized that an important cultural and organizational change is needed in order to give to logistics a new prominent role to the division. In the broader conceptualization of supply chain, logistics has no longer the role of just promoting a cost-effective and efficient flow of materials (Albertzeth *et al.*, 2020), but it rather has a critical role in enhancing the value of strategic relationships among partners, especially in turbulent times (Song *et al.*, 2022). Although previous studies recognized that logistics capabilities can be considered antecedents of the end-to-end supply chain resilience, just few of them have tried to explain in which sense they are connected (Gu *et al.*, 2021; Ivanov, 2021). In this study, we proposed that intangibles and technologies are the two main elements that favor this connection and promote logistics as a new crucial function when discussing the topic of resilience.

From the managerial perspective, this paper can be usefully exploited by companies in order to achieve higher level of resilience. To date, many firms tend to keep their intangible assets separated by the technological elements instead of merging the benefits that emerge by the combined effect of the two (Abidi *et al.*, 2022). Thus, organizations should develop and activate their ability of establishing a valuable interplay between their intangible elements and technologies, as it can have a decisive role against disruptions in the long run (Gölgeci and Kuivalainen, 2020; Polyviou *et al.*, 2019; Singh *et al.*, 2019). As such, investing in advanced technologies such as blockchain, AI, process automation, and on intangible assets of logistics can improve both risk management and resilience strategies of organizations (Fan and Stevenson, 2018). Although it might be believed that these aspects are already known by managers, from the conducted interviews emerged that many experienced managers admitted that their organizations are far from effectively implementing strategies to exploit value and resilience from this perspective. In fact, cultural and technical barriers remain when dealing with major disruptions, such as what technology (e.g., blockchain, digital twins etc.) choose and for what specific business opportunity (e.g., to enhance reverse logistics) (Gligor *et al.*, 2022; Russo *et al.*, 2019).

Although we believe that our research can contribute to advance the understanding of how organizations can enhance their resilience, we must admit that our work has some limitations. For instance, the adopted method of research does not allow us to generalize the findings. Therefore, future research should extend and expand data collection adopting quantitative research method or combining both qualitative and quantitative methods (i.e., mixed-method approach).

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Packaging, logistics and sustainability. Exploring innovative solutions for eco-sustainable packaging

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Abstract

Framing of the research: *The sustainability challenges posed by packaging value chains require urgent actions inside the international and national sustainable product policy framework and industrial strategy.*

Purpose of the paper: *The paper aims at exploring innovative solutions for eco-sustainable packaging considering the implications on logistics optimization with a specific focus on the potentiality of paper materials.*

Methodology: *After a literature review, an empirical exploration is run to briefly describe 123 successful cases of packaging innovations towards sustainability.*

Results: *Packaging can concretely contribute to achieving the business's sustainable development goals along the supply chain. The preliminary considerations underline that there are many concrete solutions for sustainable packaging, and that there are good results in terms of LCA analysis.*

Research limitations: *The empirical analysis can be extended.*

Managerial implications: *As eco-packaging emerges as a key trend in the market this research presents real case applications that propose a comprehensive map for managers and practitioners who wish to experience similar projects.*

Originality of the paper: *Logistics assumes a key role for sustainable packaging innovation in theory and in practice; that may be of particular interest to both academics and professionals in different sectors and with different roles along the entire supply chain.*

Key words: *Packaging; Logistics; Sustainability; Innovation; Supply chain; Paper and cardboard.*

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1. Introduction

Recent research reports cited in Forbes (2022¹) underline how eco-packaging emerges as a key trend in the market. A first study estimates that the global recyclable packaging market will reach 28.3 billion dollars in value with a growth rate of +7.2% compared to 2021 and will reach 34.2 billion dollars in 2026. Another study describes that 77% of consumers want to have as less packaging as possible and 63% would consider changing their shopping habits if this criterion were not met. That is a global trend that is also influencing the market in Italy where in just one year the products that explicitly communicate on the label how to handle the packaging after consumption have grown by 5% and 35.9% of the total of large-scale distribution (Forbes, 2022). In fact, the environmentally sustainable impact of packaging has been in the last years an increasingly important issue for businesses (Svanes *et al.*, 2010; Lewis *et al.*, 2007; Verghese and Lewis, 2007; Hellstrom and Nilssonon, 2011; Boz *et al.*, 2020; Nguyen *et al.*, 2020; Cozzolino and De Giovanni, 2023). Min and Galle (2001) stress that when there is a demand for green purchasing, it affects packaging, which in turn affects logistics. Many authors have emphasised the close relationship between the concepts of packaging and logistics which focuses on the synergies achieved by integrating packaging and logistics with the potential of increased supply chain efficiency and effectiveness (Garcia-Arca *et al.*, 2014; Azzi *et al.*, 2012 p. 441; García-Arca and Prado-Prado, 2008; Hellström and Saghir, 2007; Verghese and Lewis, 2007; Saghir, 2002; Lockamy, 1995; Twede, 1992). It is precisely the packaging logistics processes that make product packaging possible, flowing through the entire supply chain and defining interaction with the physical environment and the socio-economic context (Cozzolino, 2021; Vernuccio *et al.*, 2010). Furthermore, packaging influences product development and design, and production (Zhu *et al.*, 2022). The debate on the impact of packaging on the natural environment has more recently shifted towards a more holistic discussion of the impact of the packaging life cycle throughout the supply chain (Sarkis, 2003).

Along this direction, there is no one-size-fits-all solution that innovators in this field can embrace as they work on strategies for sustainable logistics packaging. According to Berg *et al.* (2020), there are complexities and trade-offs to consider if they are to navigate through these sustainability challenges in order to find the most effective route to growing and preserving value with application innovations, driving toward sustainability in packaging, but beyond the “quick wins”. This could be done clearly benchmark packaging alternatives in terms of sustainability, cost and convenience; fully understanding sustainability requirements; having the right partnerships for innovation and technology to respond to consumer and customer packaging demands going forward. In a general view, sustainable packaging compared to conventional packaging, meet higher environmental, economic and social standards, have better performance and quality features, and at the same time bring new possibilities in the field of the recovery and waste management. These standards should apply to the entire packaging life cycle - from production, through packaging, distribution, transport processes, to use and disposal (Kozik, 2020).

In a circular economy perspective, the packaging plays an important role due to its pervasiveness along supply chains, both as a product itself and as a combination of product-packaging (Cozzolino, 2022), and both in forward and reverse logistics flows, considering the principles of reduce, reuse, and recycle (Cozzolino and De Giovanni, 2023). The European Commission, in the “*Circular economy action plan. For a cleaner and more competitive Europe*” document, considers packaging among the “key product value chains” with a high potential for circularity². Accordingly, the sustainability challenges posed by packaging value chains require urgent, comprehensive, and coordinated actions that form an integral part of the European sustainable product policy framework and industrial strategy, contributing to the response to climate emergencies, and focusing on reducing (over)packaging and packaging waste, driving design for re-use and recyclability of packaging, and considering reducing the complexity of packaging materials.

¹ <https://forbes.it/2022/10/13/packaging-riciclabile-numeri-trend-mercato-forte-crescita/>

² https://ec.europa.eu/environment/pdf/circular-economy/new_circular_economy_action_plan.pdf

Along these directions, previous studies mainly focused on single case studies which consider very specific aspects of sustainable packaging linked to circular practices, with the exception of the recent work by Cozzolino and De Giovanni (2023). Therefore, very few are the studies explicitly considering the implications on packaging logistics optimization (Cozzolino, 2021). Furthermore, there has been limited analysis with a focus on paper and cardboard potentiality as a valid substitute of plastic packaging very often (Silva and Molina-Besch, 2023). Following the studies conducted by Cozzolino and De Giovanni (2023) and Cozzolino (2021), the paper aims at investigating the following research question (RQ):

RQ1 - Which innovative solutions for eco-sustainable packaging in paper and cardboard material do firms adopt?

The proposed RQ seeks to fill research gaps that have emerged from an analysis of the scientific literature. Therefore, this study brings together the identification of multiple concrete successful sustainable innovations for packaging design, considering the implications on packaging logistics optimization (for example, allowing to load a greater number of packages per pallet or by means of transport, and / or improving stackability, etc.), and with a specific focus on the potentiality of paper materials. To pursue the objectives of this study, data available through the National Consortium of Packaging (CONAI) in Italy were used. The CONAI presents a consultable showcase of the range of virtuous packaging materials on the Italian market in the last years that it has been analysed in this paper.

The remainder of the paper is organized as follows: section 2 outlines the theoretical background and identifies the research gaps; section 3 describes the research methodology; section 4 presents an analysis and discussion of the findings; section 5 concludes.

2. Literature review

The way circular economy systems truly work for firms around the world is at the beginning of knowledge development. As such, it is useful for academia and practitioners to provide an analysis of how to concretely implement and manage innovative projects to shift from a linear to circular supply chain management. Following a chronological order (from the latest back), some more recent studies from the academic literature that focus on concrete sustainable practices implemented for the circularity of packaging in paper and cardboard are synthetically described so to list the elements that most are original in the present work compared with previous research.

The study by Cozzolino and De Giovanni (2023) analyzed portfolios of sustainable practices adopted by Italian firms to enhance the circularity of packaging and related results in terms of life cycle assessment, with environmental improvements, such as reductions of CO₂ emissions as well as energy usage and water consumption, considering a large number of circular packaging projects along the last 10 years. A granular analysis of the impact of the material reveals that the specific type of packaging material (especially with a focus on paper and plastic) can change firms' preferences regarding sustainable practices they want to adopt.

Silva & Molina-Besch (2023) assessed the environmental impacts of plastic cushioning inserts vs. corrugated cardboard cushioning inserts. The cushioning options have different measurements requiring different box sizes. The results reinforce the importance of developing alternatives to plastic packaging without increasing packaging weight. Belonging to the same research stream, they cited other research on the comparison of the environmental impacts of different packaging options, as reported in the following lines. Albrecht *et al.* (2013) studied a case in Europe where disposable cardboard boxes are compared with reusable plastic crates. The study concludes that the reusable plastic option leads to lower environmental impacts and lower costs, with the assumption that about 80% of the cardboard is incinerated with energy recovery and the remaining about 20% is recycled. Abejón *et al.* (2020) presented the opposite assumption: 80% of cardboard packaging waste is recycled and 20% is incinerated with energy recovery. The Global Warming Potential-GWP of disposable cardboard boxes is around 10 times higher than the GWP of the reusable plastic crates.

Accorsi *et al.* (2022) included disposable plastic packaging in the analysis, and their results show that disposable plastic packaging represents the highest GWP (20 years) of the three options. Moreover, after 15 uses, reusable plastic crates lead to a lower GWP than disposable cardboard boxes. Another similar case study is by Koskela *et al.* (2014): they found that one-way cardboard boxes lead to lower emissions due to the impact of extra weight in reusable plastic solutions. Similarly, Lo-Iacono-Ferreira *et al.* (2021) in their research discovered that one-way cardboard boxes produce lower emissions. Sasaki *et al.* (2022) highlighted the importance of considering protection levels when comparing packaging alternatives. They conclude that reusable plastic packaging and one-way cardboard boxes had similar environmental performances, but the former leads to higher food loss. This aspect of protection is vital for any product that can be damaged during transport and handling.

Coelho *et al.* (2020) reviewed the trends in reusable packaging and the literature on reusable packaging to generate insights into the current state-of-the-art knowledge and identify directions for research and development. This can help to better understand the key factors underlying the design and impacts of more sustainable packaging systems. New research includes the need to monitor the effectiveness and efficiency of current systems and new opportunities in packaging; along this way design may also play an important role for packaging systems.

Ferrara and De Feo (2020) applied the life cycle assessment methodology to compare the environmental performance of the traditional single-use glass bottle for wine with four packaging alternatives (aseptic carton, bag-in-box, refillable glass bottle and multilayer PET bottle) for the Italian market. This study highlighted the importance of considering the wine packaging as a system, i.e. including also the production and use of secondary and tertiary packaging. They pointed out that the good recyclability of a material generates great confusion in the common imaginary: people confuse the recyclability of a material with its sustainability, completely neglecting the impacts associated with the production and transport of the material.

Burek *et al.* (2018) evaluated various packaging solutions generally used in the milk industry and developed comparisons according to an LCA. Their analysis demonstrated that the adoption of lightweight and fully recycled containers can considerably improve environmental impacts. The U.S. packaging market needs to increase milk packaging variety based on precompetitive collaboration and sharing knowledge on improving all segments of fluid milk and container production and delivery; the success of the new packaging depends on assessing the system as a whole.

Geueke *et al.* (2018) provided an overview of the most important properties of food packaging materials affecting their recyclability, as recycling is fundamentally relevant to achieving a circular economy. In addition, recycling practices are exemplified for the different materials, along with decontamination options for removing chemicals of concern. Finally, criteria for successful reduction, reuse, and recycling are discussed with regard to permanent and non-permanent packaging materials. Among those identified as most common types of food packaging materials they explicitly consider paper and board. As indicated in Geueke *et al.* (2018), citing Lofthouse *et al.* (2017), packaging redesign can significantly contribute to reduction, reuse, or recycling, if the end of life is already considered during packaging development.

Saraiva *et al.* (2016) developed a study on a packaging dedicated to transportation of Brazilian mango fruits from producer to end-consumer aiming at reducing food losses in the food supply chain. A life cycle assessment was used to compare the environmental performance of a reusable frame, made from high density polyethylene reinforced with natural sponge fiber residue, and a high impact polystyrene recyclable tray, with those of an identical packaging produced without natural fibers and a commercial cardboard packaging. The paper contributed in the literature on transport and packaging that can result in a substantial contribution to the overall environmental impact of the fruit supply chain.

Dominic *et al.* (2015) studied a corrugated box for a specific firm product and found opportunities in the technical design, supply chain implementation and environmental impact of this packaging, in terms of optimization of product protection, waste and CO₂ emissions. They

proposed that future research with respect to an integrated packaging design model should factor a greater understanding of waste/product loss across the supply chain, and the recycling/reusability of the material, leading to a higher percentage of secondary content in produced materials.

Previous research is mainly focused on trying to clarify the environmental implications between returnable plastics and one-way cardboard transport packaging, as the literature diverges in the comparison of the environmental impacts of these two options (Albrecht *et al.*, 2013; Koskela *et al.*, 2014; Abejón *et al.*, 2020; Lo-Iacono-Ferreira *et al.*, 2021; Accorsi *et al.*, 2022; Sasaki *et al.*, 2022; Silva and Molina-Besch, 2023), and does not pay much attention to the potential of more cases options. In fact, while the analyzed studies mainly focused on either a single case or product in a specific sector, this research seeks to develop more generalizable findings, as also Cozzolino and De Giovanni (2023) did. Moreover, even if the general literature has emphasized the close relationship between the concepts of packaging and logistics and their synergies and potential of increased supply chain efficiency and effectiveness toward sustainability, not so much are the empirical investigations on logistics implications in the face of reduce, reuse and recycle practices. Coelho *et al.* (2020) indicated among key factors that affect the economics and environmental impact of packaging reuse logistics (both organization and transport distance). Raw material saving and logistics optimization emerged from Cozzolino and De Giovanni (2023) as the most frequent sustainable practices adopted by firms to improve circularity of packaging. Furthermore, most of the literature has focused on the adoption of single sustainable practices to improve the sustainability of packaging; when a portfolio of sustainable practices was studied, it was limited to two sustainable practices, for example, Ferrara and De Feo (2020) and Saraiva *et al.* (2016); in contrast, Cozzolino and De Giovanni (2023) considered simultaneously the three. Following these gaps, the present paper investigates the most frequently adopted sustainable practices for packaging in paper and cardboard, with logistics optimization implications, inside a variety of different cases from different economic sectors.

3. Methodology

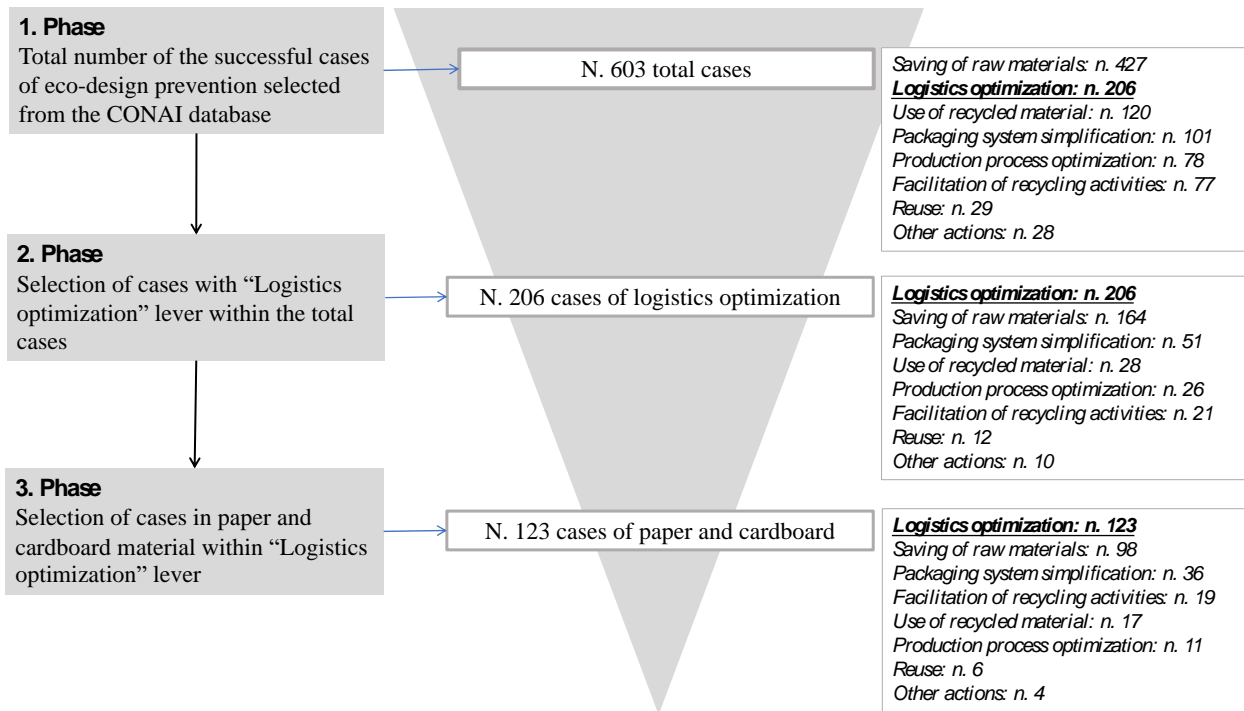
Cases are selected from the CONAI database entitled “Successful cases” of eco-design prevention. The CONAI’s purpose aims to raise awareness on prevention topic for all the supply chain, from producer to consumer, to realize the transaction toward both circular economy criteria and sustainable development goals. Prevention for CONAI is a set of policies, programs and best practices, taken before a substance, material or product has become waste. In reference to packaging solutions, one of the most important challenges is to minimize environmental impacts with a life cycle approach. Following this direction, the CONAI presents a consultable database of the range of virtuous packaging materials on the Italian market in the last years³.

From a total numbers of cases of 603, referring to all the categories (liquid food, solid food, personal care, domestic detergent, container ideas, ideas for abroad, other areas), the last 10 years and all the mapped levers (logistics optimization, facilitation of recycling activities, raw materials saving, optimization of production processes, reuse, simplification of the packaging system, use of recycled material, other), 123 cases have been obtained in the respect of the two criteria of selection (see Figure 1):

- logistics optimization lever;
- paper and cardboard material (alone, and also in combination with plastic, glass and wood).

³ www.conai.org

Fig. 1: Sample selection process.



Source: author elaboration.

To answer RQ, the most frequent sustainable practices adopted by firms to increase the sustainability of paper/cardboard packaging, considering the optimization of logistics, are mapped. Also, the possible combinations of sustainable practices are described. Moreover, the main results of the LCA (Life Cycle Analysis) are reported. These is useful to derive state-of-the-art innovative practices analyzed.

4. Empirical results and discussions

The cases analyzed are composed of paper and cardboard packaging, among those 83 are only in paper or cardboard material, while 36 are paper and plastic, 3 in paper and glass, and 1 in paper, plastic and wood (see Table 1).

Tab. 1: Materials.

Material	Cases
Paper	83
Paper and plastic	36
Paper and glass	3
Paper, plastic and wood	1
Total	123

Among the adopted practices, within the cases of logistics optimization, saving of raw materials was found the most frequent in 80% of the cases of packaging, following by packaging system simplification (29%), facilitation of recycling activities (15%), use of recycled material (14%), production process optimization (9%) and reuse (5%), as shown in Table 2.

Tab. 2: Levers.

Lever	Logistics optimization (LO)	Saving of raw materials (SRM)	Packaging system simplification (PSS)	Facilitation of recycling activities (FRA)	Use of recycled material (URM)	Production process optimization (PPO)	Reuse (R)	Other actions (OA)
Number of cases	123	98	36	19	17	11	6	4
%	100%	80%	29%	15%	14%	9%	5%	3%

Together with the optimization of logistics, that only in 10 times is alone in the innovative projects of packaging, other practices are implemented in combination (see Table 3). The most frequent combinations are between 2 or among three levers: they are mainly logistics optimization and saving of raw materials, and also packaging system simplification. Few cases are in combination with 4 or 5 lever simultaneously. The 4-lever combination is among logistics optimization, saving of raw materials, facilitation of recycling activities, and (equal) packaging system simplification or use of recycled material. The combination with 5 levers is characterized by logistics optimization, (equal) saving of raw materials or packaging system simplification or use of recycled material, following by facilitation of recycling activities and production process optimization.

Tab. 3: Combinations.

Numbers of levers per case	Frequency	Most frequent combination
1	10	Logistics optimization (10)
2	57	Logistics optimization (57) & Saving of raw materials (48)
3	37	Logistics optimization (37), Saving of raw materials (32) & Packaging system simplification (22)
4	16	Logistics optimization (16), Saving of raw materials (15), Facilitation of recycling activities (10) & Packaging system simplification/Use of recycled material (9)
5	3	Logistics optimization (3), Saving of raw materials/Packaging system simplification/Use of recycled material (3), Facilitation of recycling activities (2) & Production process optimization (1)

The 19 cases that present the major combination of practices (16 with 4 levers, and 3 with 4 levers) are reported in Table 4, with their qualitative description.

Tab. 4: Cases with major combinations.

Firm	Case description	LO	FRA	PPO	SRM	R	PSS	URM	OA
Scatolificio Porrettana S.r.l.	The new packaging solution designed by Scatolificio Porrettana Srl is perfectly suited to four types of engines and has better environmental performance compared to the previous solution. The packaging, initially made up of a corrugated cardboard component and EPS components, was replaced with a new mono-material packaging system, 9% lighter, entirely composed of corrugated cardboard, allowing recycling activities to be facilitated. The new packaging has also allowed for a 100% optimization of logistics.	1	1	0	1	0	1	0	0
HP Italy S.r.l.	In 2019, HP redesigned toner cartridge packaging for color printers to improve recyclability and optimize the use of raw materials. The weight of the cardboard box has been reduced by 36%, the HDPE side protections have been replaced by 100% recycled paper elements, thus preferring a single-material solution, and the quantity of units per pallet has increased by 43%. thanks to the reduction in the size of the box.	1	1	0	1	0	0	1	0
Cartotecnica Jolly Pack S.r.l.	The intervention carried out concerns the redesign of the display containing balsam cardboard cases initially consisting of a base, a lid and a corrugated cardboard	1	0	1	1	0	1	0	0

	<i>crowner. The new solution consists of a single cardboard element that can hold 18 balm cases, instead of 12. In addition to this simplification, the weight of the balm case has been reduced by 31%. Overall, the intervention makes it possible to transport 20% more product on the pallet and to reduce process waste, thanks to the optimization of the die-cutting yield of the display (2 pieces instead of 1 on sheet) and of the cartons (24 pieces instead of 16 on sheet).</i>								
<i>Hipac S.p.a.</i>	<i>Hipac has created a new and innovative technical stretch film in LLDPE, intended for the packaging of industrial products, which combines a reduced thickness of 48%, compared to the film normally used for the same purpose, with the use of 67% recycled material. The reduction in thickness has allowed savings in raw material, optimization of logistics, thanks to the increase in the number of reels transported on the pallet, and a reduction in energy consumption during the production process (-35%). Furthermore, the cardboard core on which the film was wrapped has been eliminated, simplifying the system.</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>Duracell Italy S.r.l.</i>	<i>The company has changed the primary packaging of the 6 AAA batteries of the Plus line and the Ultra line, initially consisting of a blister with a cardboard base and PET shell. The new, simplified solution provides for a single cardboard box with a higher percentage of secondary raw material. The transition to mono-material packaging has led to an improvement in the recyclability of the same packaging. Furthermore, the new case, reduced in size, also had a positive effect on logistics.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>Scia Packaging S.r.l.</i>	<i>The packaging for containing glass bottles, initially consisting of a box and corrugated cardboard separators, has been replaced by a single box with incorporated separators. This solution allows the creation of the packaging in a single die-cut, with a single printing and die-cutting stroke, as the dividers are obtained from the body of the main packaging with consequent energy savings (about -9%). Furthermore, the new structure guarantees the same resistance to stacking by using a corrugated cardboard with a single wave instead of a double one. The weight of the packaging was reduced by around 45% and the number of products transported on the pallet increased by 42%.</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>
<i>Litocartotecnica Valsabbina S.r.l.</i>	<i>The packaging for the door handles has been redesigned allowing for a 25% reduction in the cardboard box, the elimination of the LDPE protective component and a greater product load on the pallet. The intervention also had positive effects on the production process as the new box design allowed for a 77% reduction in production waste.</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>
<i>Gias S.r.l.</i>	<i>Gias Srl, a Candy Hoover Group company, has revised the packaging intended for the containment and transport of refrigerator gaskets. The new primary packaging in corrugated cardboard has been reinforced allowing the elimination of the external cardboard box and the plastic protection and closure elements. The intervention has favored the reduction of over 60% of raw material and an increase of 500% in units transported.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>
<i>4P SRL</i>	<i>4P SRL manufactures and sells palmtop computers for professional applications all over the world. In 2015 it renewed the packaging system of the FDA600 handheld computer with a view to greater environmental sustainability. The packaging system, initially made up of a paper and a plastic component, has been made mono-material and more easily recyclable. The outer component also contains a higher percentage of</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>

	<i>recycled material than the previous packaging. Furthermore, the redesign of the packaging has favored a reduction in both weight and volume, optimizing logistics operations with a 148% increase in primary packaging transported on standard pallets.</i>								
<i>Vimar S.p.a.</i>	<i>The packaging of the power strip with cable has been redesigned from a solution that included a PVC film/film, a cardboard sheet and a PVC shell to a solution consisting of an HDPE bag and a cardboard label. This intervention has allowed the elimination of the film/film, the reduction in weight of the plastic packaging (-87%) and the optimization of logistics. In addition, the company uses a product transport box whose percentage of recycled material used for the production of the same has increased from 30 to 70.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>BB Line S.r.l.</i>	<i>BB line Srl, which produces accessories and solutions for decorating windows, launched the EcoPack project a few years ago with the use of low environmental impact packaging. In 2014, the project was further extended to other products whose previous packaging, made up of a sheet of cardboard containing 95% recycled paper and a PVC shell, was replaced by a cardboard made from 100% recycled paper and a thin polyurethane strap that fixes the product to the cardboard. Overall, the intervention has made it possible to increase the company's environmental performance.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>
<i>Big Paper Italia S.r.l.</i>	<i>The solution before the intervention, made up of a laminated paper-HDPE sheet on which the food rests, an HDPE sheet that protects the food and a paper bag that encloses everything, has been replaced by Big Paper from a single component coupled with 100% recycled paper and mater-bi film. This intervention has allowed an overall weight reduction of 62% and positive effects in terms of logistics, also thanks to the introduction of side flaps which allow the entire available surface to be used.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>Elica S.p.a.</i>	<i>The packaging for Elica SpA extractor hoods has been modified according to the "less air to transport" approach. The packaging, which was made up of a corrugated cardboard box, a low density polyethylene film and polystyrene protectors, now consists of a corrugated cardboard box whose weight has been reduced by over 20% for the same of performance, from the LDPE film and from the PP strap, and allows an increase in the transportability value of 36%. Since 1999, the company has had an Environmental Management System compliant with the UNI EN ISO 14001 standard.</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>
<i>Gianasso S.r.l.</i>	<i>Saponificio Gianasso has redesigned the packaging of the 400 ml scented almond oil shower gel - Green tea from the I Provenzali line. The new bottle, compared to the previous version, is made with 100% recycled PET (+50%) and is 10% lighter. The weight of the cap has also been reduced by 38%. The packaging has also been simplified since the collar around the bottle has been eliminated and only the 100% recycled PPL label has been kept. These interventions also produced positive effects on logistics activities, allowing the transport of 30% more product.</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>0</i>
<i>Bticino S.p.a.</i>	<i>BTicino has replaced the packaging for adapters made up of a PVC blister and an internal sheet of cardboard with a new packaging made up of a poly laminate cardboard and LDPE film. This innovation has led to a reduction in the weight of the packaging by about 50% and, consequently, in the supply of raw materials for production. Furthermore, the new system, considering a standard pallet, allows the transport of 75% more packaging than the previous version. Bticino has a UNI EN ISO 14001 certified Environmental</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>

	<i>Management System.</i>								
<i>BB Line S.r.l.</i>	<i>BB Line, in collaboration with Leroy Merlin, has created the packaging for curtain rods which allows for an overall saving of 16% in raw materials and an increase in the percentage of recycled material for the cardboard which goes from 95% to 100%. Finally, the smaller size of the packaged products has allowed for an important optimization of logistics.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>
<i>BB Line S.r.l.</i>	<i>BB Line, in collaboration with Leroy Merlin, has proposed a packaging that reduces the use of overall raw material by 42% with an increase in the percentage of recycled material for the cardboard which goes from 95% to 100%. The smaller size of the packaged products has also allowed for a significant optimization of logistics.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>
<i>BB Line S.r.l.</i>	<i>The new packaging solution, proposed by BB Line in collaboration with Leroy Merlin, reduces the overall use of raw materials by 35% by proposing the accessories for the awning directly fixed to the cardboard, eliminating the previously used PVC shell. The cardboard used is made with 100% recycled paper (previously it was 95%). Finally, the intervention carried out allowed an 80% increase in the number of products transported on standard pallets.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>
<i>BB Line S.r.l.</i>	<i>BB Line, in collaboration with Leroy Merlin, has created a new packaging for the line of accessories for awnings which includes numerous models. The previous solution consisted of a sheet of cardboard, containing 95% recycled paper, and a PVC valve which contained the curtain rods. For the new packaging, the valve has been replaced by a thin polyurethane strap that fixes the curtain rods to the cardboard, now made from 100% recycled paper. This modification has allowed an overall saving of 45% in raw materials and a 50% increase in the product transported on standard pallets.</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>

From the description of the cases emerged that most of the innovations regarding the optimization of logistics consider the packaging as a system. Twede (1992) refers to the “packaging system”, composed by three levels of packaging that can be distinguished (intimately related to logistics) in: primary packaging (or “sales packaging”, or “consumer packaging”), secondary packaging (or “group packaging”, or “distribution packaging”), and tertiary packaging (or “transport packaging”). This explicitly recognises packaging as a hierarchical system, the performance of which is affected also by the interactions between levels, and not only by the performance of each single packaging level (Hellstrom and Saghir, 2007). Very often the innovation on the primary packaging may have implications on secondary and tertiary, multiply the sustainable effect. This could be an implication useful for managers and academics working on packaging management not only in a “punctual” way, but with a systemic approach. The text in bold inside the description of the cases evidences the logistics implications, both qualitative (optimization of logistics) and quantitative (i.e. with the increased percentage of units per pallet or of units transported than the previous version).

All the cases presented a better impact after the packaging innovation project on the measurement of LCA. Only some of them (5) also have evaluated MPS, but with good results, between 35% and 80%: a higher value after the innovation initiative, with a positive effect on the amount of Secondary Raw Material generated. Table 5 shows in particular the LCA results, a life cycle assessment is a very important process to evaluate environmental burdens associated with a product, by quantifying the energy and materials used and the wastes and emissions released over the entire life cycle (Pauer *et al.*, 2019).

Tab. 5: LCA.

	N. cases with reduction $\geq 50\%$	N. cases with reduction between 50% and 30%	N. cases with reduction $\leq 30\%$
LCA - CO2	30	27	66
LCA - Energy	26	23	74
LCA - H2O	27	15	81

All the analyzed cases have reported reduced impact in comparison with the initial stage, before the implementation of the innovation, this underlines how important are the sample cases to guide packaging towards sustainability. Packaging can concretely contribute to achieving the business's sustainable development goals along the supply chain. The preliminary considerations underline that there are many concrete solutions for sustainable packaging, and that there are good results in terms of LCA analysis.

These results and considerations may be a useful comprehensive map for managers and practitioners embedded with packaging decisions who wish to experience similar projects, and also as a basis for more theoretical implications and research.

5. Conclusion

The sustainability challenges posed by packaging value chains require urgent actions inside the international and national sustainable product policy framework and industrial strategy. Along this way, the paper explored innovative solutions for eco-sustainable packaging considering the implications on logistics optimization with a specific focus on the potentiality of paper materials. Logistics assumes a key role for sustainable packaging innovation in theory and in practice, and paper packaging has a great potentiality as a valid substitute of plastic packaging very often.

After the literature review, the empirical exploration was run to briefly describe 123 successful cases of packaging innovations towards sustainability. The main results indicate that packaging can concretely contribute to achieving the business's sustainable development goals along the supply chain: there are many concrete solutions for sustainable packaging adopted by firms, and that there are good results in terms of LCA analysis. Managerial implications may arise from this research, as eco-packaging emerges as a key trend in the market: in fact this research presents real case applications that propose a comprehensive map for managers and practitioners interested in eco-sustainable innovations and who wish to experience similar projects.

Even if the paper permits some preliminary consideration on the topic, it deserves to be more developed especially in term of the analysis of the cases, inspiring also other stream of research.

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Corporate Social Responsibility and Financial Performance: an Empirical Analysis of the Italian Case

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Abstract

Framing of the research. *Since 2012, European directives have involved CSR-related issues, supporting “honest” entrepreneurs and sustainable business paradigms. EU States are introducing new CSR-tools into their legal systems, and Italy introduced the “legality rating” in order to promote firms’ ethical behaviours and rewarding the most “sustainable” ones.*

Purpose of the paper. *Research aims to analyze the relationship between the introduction of the “legality rating” and firm’s financial performance. The hypothesis underlying the study concerns a positive impact of the tool.*

Methodology. *We implemented a panel data-type regression analysis considering a sample of 100 “rated” firms located in the Lazio region.*

Results. *The analysis shows that the introduction of the “legality rating” guarantees an improvement in the financial performance of considered companies.*

Research limitations. *Main limitations regard the Italian low maturity about CSR issues and consequently the scarce relevance of the data provided by Agcm. Companies with “legality rating” could behave in an unethical manner while maintaining their “virtuous” status. This can invalidate the work’s results.*

Managerial implications. *This research offers food for thought for the academic world which is increasingly attentive to CSR issues. It also fits into the literature that could be useful for managers to understand how to voluntarily improve their financial performance.*

Originality of the paper. *The paper contributes to the expansion of the literature on the theme, considering the specific case of Lazio, where a high density of “rated” companies can be traced and considering Return On Debt as independent variable in the regression model.*

Key words: *legality rating; Corporate Social Responsibility; EBITDA; corporate financial performance; sustainability; sustainable development.*

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1. Introduction

1.1. ESG vs CSR: main differences

To better understand the purpose of this work, and therefore its results and consequent implications, it is essential to investigate the main differences between two concepts, sometimes erroneously juxtaposed in terms of similarity, namely *ESG* and *CSR*. For Liang and Renneboog (2020), *ESG* (*Environmental, Social and Governance*) criteria represent an additional element and an extension of the concept of “*Corporate Social Responsibility*”. Sila and Cek (2017) and Hakansson and Salus (2021), on the other hand, trying to develop a clear definition of the two concepts, argue that *ESG* scores represent a proxy and a unit of measurement thanks to which the concept of sustainability manages to overcome the limit deriving from an application of the term exclusively in the environmental field. Alva (2020) argues that the main difference lies in the fact that *CSR* has the aim of making businesses accountable for their impact on sustainability; *ESG* performance, on the other hand, represents a fundamental element for measuring the effort of companies and systems in terms of sustainability.

For the United Nations (2022), *Corporate Social Responsibility* is a “*management concept*” whereby companies integrate social and environmental concerns in their business operations and interactions with their stakeholders. *CSR* is generally understood as being the way through which a company achieves a balance of economic, environmental and social imperatives (“*Triple-Bottom-Line- Approach*”)¹.

Carroll (2018) defines *CSR* as a concept that summarizes the responsibility of businesses regarding aspects of society that go beyond the needs and interests of stakeholders and investors. The same line of thought is followed by Calveras *et al.* (2007) and Benabou and Tirole (2010). Therefore, *Corporate Social Responsibility* can be defined as a precursor of *ESG*. The latter is instead a unit of measurement that allows interested parties to define a tangible and measurable activity with a positive impact in various contexts, today with close interrelationships with firms’ financial performance.

1.2. Corporate Social Responsibility across Europe: perceptions and characteristics

Today’s international economic scenario is characterized by changing firm strategies which, taking into account the needs of the stakeholders, are inserted in a context permeated by an high level of competition between companies. Furthermore, market dynamics are increasingly exacerbating the need for a direct relationship between businesses and society and European companies are called to adopt *CSR* tools suited to their organizational, promoting their *Corporate Social Responsibility* strategies as a response to a variety of social, environmental and economic pressures. In doing so, companies are investing in their future, and they expect that the voluntary commitment they adopt will help to increase their profitability and to improve their economic and financial performance.

By stating their social responsibility and voluntarily taking on commitments which go beyond common regulatory and conventional requirements, companies endeavour to raise the standards of social development, environmental protection and respect of fundamental rights and embrace an open governance, reconciling interests of various stakeholders in an overall approach of quality and sustainability (*EU Commission, 2001*). These actions lead to the development of new partnerships and also new spheres for existing relationships regarding social dialogue, skills acquisition, equal opportunities and management of change, at the local or national level (Barile *et al.*, 2006).

It could be argued that the *CSR* is, essentially, a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment: European citizens and stakeholders have

¹ A properly implemented *CSR* concept can bring along a variety of competitive advantages, such as enhanced access to capital and markets, increased sales and profits, operational cost savings, improved productivity and quality, efficient human resource base, improved brand image and reputation, enhanced customer loyalty, better decision making and risk management processes.

now growing expectations of the evolving role of companies in the new and changing society of today (Venturelli *et al.*, 2018). The main challenge is about how *CSR* can contribute to the Lisbon goal of building a dynamic, competitive and cohesive knowledge-based economy: in fact, Lisbon European Council made a special appeal to companies' sense of social responsibility regarding best practices on lifelong learning, work organisation, equal opportunities, social inclusion and sustainable development.

The main objective of all European companies certainly remains profit; however, companies can, at the same time, contribute to social and environmental objectives, through integrating *Corporate Social Responsibility* as a strategic investment into their core business strategy, their management instruments and their operations².

2. Framing of the research

The last twenty years have been characterized by a disruptive advance, in the corporate world, of issues related to the world of sustainability and the so-called “*sustainable development*”. In particular, both at European and International level, the academic world studied and analyzed in depth the aforementioned topics, while the corporate world has focused its attention on new strategies and tools capable of complying with the new regulations on the subject and therefore guaranteeing achievement of high standards of “*sustainable*” corporate performance. In this regard, there is talk of a “*new sensitivity*” regarding *CSR* issues, and companies are called to identify new ways to improve their competitive advantage, to improve their financial performance and to differentiate themselves from competitors.

Since the capitalist system began to suffer of a crisis of liquidity, credibility and confidence (Townsend, 2014; Sklair, 2015), new obstacles and challenges, both of an operational and purely regulatory nature, have arisen for business organizations, which can be overcome through a careful implementation of the *CSR* paradigm in corporate strategies³: a much-discussed aspect of the new sensitivity towards social and environmental issues is the incessant growth, by stakeholders, of a direct and unfiltered relationship with the corporate reality on which their interests depend.

Researchers and practitioners pay the utmost attention to these *CSR*-related issues and *Corporate Social Responsibility* becomes one of the fundamental features of corporate business practice, capable of improving corporate engagement on the reference market and boosting the financial return of certain “*social*” strategies.

In this competitive context, characterized by disruptive technologies and changing balances, the business world is called to outline *CSR* tools capable of bridging the “*social gaps*” and establishing new business models that can have favorable repercussions on:

- economic-financial performance;
- corporate reputation (Neville *et al.*, 2005; Mcgunagle *et al.*, 2016);
- corporate governance;
- products attractiveness;
- competitive advantage (McWilliams and Siegel, 2011).

Although there are numerous examples of *CSR*-related actions and strategies at an International level, the European case presents some peculiarities that deserve an in-depth analysis. The *EU* legislator dictates rather articulated rules in this regard, and managers are ready to look for the fundamental drivers to improve their competitive position and therefore their market share.

² *CSR* should be treated as an investment, not a cost, much like quality management.

³ The main contradiction of global capitalism is the “*unsustainability*” of the global economic system in terms of environment and natural resources. Globalizing corporations recognize the class polarization crisis, but largely in marketing terms. In most communities around the world the absolute numbers of people who are becoming global consumers have been increasing rapidly over recent decades.

Since 2012, European directives have involved *CSR*-related issues (Polonsky and Jevons, 2012; Acquier *et al.*, 2017), supporting “*honest*” entrepreneurs and sustainable business paradigms⁴. So, although in different ways, *EU* States are introducing new tools into their legal and regulatory systems, very often on a voluntary basis, aimed at guaranteeing a more sustainable approach on the market. In particular, in addition to issues strictly related to *CSR*, a strategic role is assumed by the issue of *ESG* reporting. *Directive EU/2014/95*, concerning the non-financial reporting of companies, intervened by regulating the matter and encouraging the Member States to undertake a process of harmonization of the national legislation with the Community one.

An emblematic example is certainly that of “*legality rating*”, a tool introduced in the Italian legal system in 2012, and aimed, according to a purely rewarding approach, at promoting ethical behaviours by entrepreneurs and rewarding the most “*sustainable*” companies through measures concerning creditworthiness towards banks and corporate reputation in the reference market⁵. For the statistics regarding the rating, see the following Tab. 1.

Tab. 1: “*Legality rating*” statistics 2013-2022

Statistics 2013 - 2022	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Legality rating	95	188	1211	1795	3176	3897	4106	4584	5183	5835
Attributed	90	182	1078	1580	2472	2846	2827	2722	3463	4287
Renewed	-	-	42	70	438	691	972	1575	1381	1153
Incremented	-	-	18	54	129	227	196	174	206	235
Revoked	-	-	7	7	16	29	42	48	50	49
Denied	5	6	66	84	121	94	69	65	83	111

Source: *Agcm*, 2022

From an in-depth analysis of the Italian legislation and of the dataset provided by the *Agcm* (*Autorità Garante della Concorrenza e del Mercato*), as will be seen later in this paper, it is possible to find a close connection between the “*legality rating*” and the financial performance of the companies which, over the years, have applied for it. Taking into account the already present literature on the subject, and using multiple logistic regression, the study aims to analyze the impact of this “*new sensitivity*” on the financial performance of a sample of companies operating in Lazio region, Italy. Even in presence of an ever-present hostility of the corporate world towards non-economic-financial issues, the study intends to evaluate the possibility of a positive impact of the rating on firms’ performance.

3. Literature review

3.1. *CSR*: role and developments

In literature, the topic of *CSR* is closely linked to that of *ESG*. *Corporate Social Responsibility* has numerous definitions: Carroll (2018) defines it as a tool that allows companies to act in the interest of stakeholders with a positive impact on social and environmental aspects. Calveras *et al.* (2007) define *CSR* as a behaviour with the fundamental characteristic of voluntariness, which companies adopt in relation to social aspects. *CSR* is also understood as a way of self-regulation (Hakansson *et al.*, 2021). Liang and Renneboog (2020) define it as “*sacrificing one’s profits in the social interest*”. In recent years, the topic has been the subject of numerous re-evaluations and interpretations (Alva, 2020; Billio *et al.*, 2021). Most have focused on the tangible aspect of the

⁴ The European Commission supports the development of ethical business strategies, today, through a combination of voluntary and mandatory actions consistent with the United Nations 2030 Agenda for Sustainable Development and associated Sustainable Development Goals (SDGs) objectives.

⁵ The so-called “*legality rating*” represents a reward system for those enterprises that abide by the law and adapt their organisations and business activities to follow suit, with the aim of increasing the security and the competitiveness of the market.

topic: *CSR* is for Dorleitner *et al.* (2015) and Li *et al.* (2021) a way to make a business accountable. It follows that *ESG* factors are to be considered units of measurement for comparing the *CSR* activities of different companies (Wang *et al.*, 2016; Steurer *et al.*, 2011; La Rosa *et al.*, 2021). The issue of *CSR* and “*legality rating*” is then to be included in a regulatory trend which, in some ways, goes beyond the scientific one and lays the foundations for a more practical implementation of *CSR* oriented activities (European Commission, 2020; 2021).

Part of the literature focuses on the voluntary nature of *CSR*-related strategies (Dahlsrud, 2008; Kumar *et al.*, 2016), while a larger part of it focuses on *CSR* tools that companies can adopt (Neville *et al.*, 2005; Sierra-Garcia *et al.*, 2015; Brogi *et al.*, 2022). Of the latter, the strategic value is recognized (Hall, 1993; Neville *et al.*, 2005), which has a positive influence on corporate reputation (Chan *et al.*, 2014), competitive advantage (Campbell, 2007; Lys *et al.*, 2015; Cahan *et al.*, 2015) and financial performance (Del Baldo, 2012; Caputo and Rizzi, 2018; La Rosa *et al.*, 2021). Further studies investigate the relationship between *CSR* and the *Resource Based View* framework and the impact of the latter on firms’ performance (Wang and Sarkis, 2017; Platonova *et al.*, 2018; Hanas *et al.*, 2018), while other authors analyze the issue from an “*external*” perspective, affirming a positive correlation between the adoption of *CSR* tools and competitive advantage (Orlitzky *et al.*, 2013). Finally, part of the literature shows a positive relationship between *CSR* and financial performance: *CSR* implies, often indirectly, better financial performance due to its natural ability to support the generation of value over time (Siltaoja, 2006). However, this relationship could lead to unethical and harmful results for the company (Barnett and Salomon, 2012), above all by virtue of tools with unclear characteristics for the players concerned.

3.2. *Towards a culture change: the italian “legality rating”*

The present work flows into the line of studies concerning the so-called “*rating culture*” in the corporate environment (Steurer *et al.*, 2011; Chan *et al.*, 2014; Cahan *et al.*, 2015; Altman, 2015). Today, we are witnessing a “*paradigm shift*” in terms of evaluating corporate performance, and businesses and investors are exploring new ways to evaluate social performance (Barnett and Salomon, 2012; Wang and Sarkis, 2017; OECD, 2022). More and more investors are interested in going beyond assessing *ESG* risks that companies are exposed to themselves: they are also considering business impacts on society and the environment (Idowu and Schimpdeter, 2015; Hanas *et al.*, 2018). Some jurisdictions, like the *EU* one, want to go beyond mandating businesses to disclose financially material *ESG* risks by including such impacts in forthcoming disclosure standards (Wang and Sarkis, 2017). But even among those standards that focus on business impacts, the emphasis is placed on what businesses do, rather than actual outcomes or impact.

For Altman (2018), to fully understand the current and future financial situation of companies, it is essential to re-evaluate a credit culture and to use an adequate rating system capable of externalizing complex information in a simple and effective way. Such an approach is also used in the *CSR* field (Battaglia *et al.*, 2010): national legislators encourage responsible behaviour by companies and all the legal frameworks are implementing a series of measures aimed at allowing a rapid harmonization of national legislation with the European one.

The European Commission supports the development of ethical business strategies, today, through a combination of voluntary and mandatory actions consistent with the United Nations 2030 Agenda: the most important current horizontal piece of *CSR*-related *EU* legislation is *Directive 2014/95/EU (non-financial reporting Directive)*, that sets out the rules on disclosure of non-financial and diversity information by large companies and has decisively influenced the application of the “*legality rating*”, introduced in Italy through *Decree Law 1/2012* and subsequently ratified by *Law 62/2012*. The rating represents, according to the legislator’s vision, an instrument aimed at favouring the diffusion of a business culture more oriented to issues related to legality and ethics (Calabrò and Mussolino, 2013). Following the “*efficient simplification*” logic, the rating attributes a number of “*stars*” (maximum 3) which symbolize the degree of sustainability and ethics of the company’s activities and therefore the businesses’ creditworthiness (Agcm, 2012; 2014; La Rosa *et*

al., 2021). In the last decade, scientific literature analyzed peculiarities and limitations of this new tool under various aspects: some studies examined purely “*normative*” aspects (Bosetti, 2018), while others have focused on an empirical analysis of the phenomenon (Caputo and Pizzi, 2018; 2021), affirming a positive correlation between improvement in economic-financial performance and attribution/renewal of the “*legality rating*”. La Rosa and Bernini (2021) and Pizzi *et al.* (2020) consider the rating as a tool for measuring the ethical behaviour of a company and its financial performance, while Becchetti *et al.* (2020) and Ginesti *et al.* (2018) use it as a proxy to measure corporate reputation and corporate governance’s best practices.

A further line of studies has focused on the analysis of the regulatory and financial determinants of the rating, as well as on the relationship between rating and insolvency risk of the companies that have adopted it (Caputo and Pizzi, 2018); also in this case, its positive impact is confirmed and therefore, its presence, over the years, determines a reduction in the probability of company insolvency.

Among the studies investigating the determinants of rating, Ginesti *et al.* (2018) examine whether human capital efficiency is a key factor of corporate reputation (central element of the rating itself), while Dawson *et al.* (2019) focus on the regulatory antecedents about CSR in our Country.

La Rosa and Bernini (2021), on the other hand, define the rating as an “*ethical tool*” to reward virtuous entrepreneurs. This latest study deviates from what was said in previous years, and states that the rating is not to be considered a performance indicator, but rather a mere score whose purpose is to verify the existence of specific prerequisites, exclusively useful for reputational purposes. Consequently, the rating is not considered a benchmark for evaluating CSR, since legality is only one of many aspects considered in evaluating a company’s social performance (Carroll, 1991).

4. Purpose of the paper

To the author’s own knowledge, previous research partially understood the relationship between “*legality rating*” and firms’ financial performance. Literature lacks an effective analysis of the effects of the rating on Italian companies in these terms. In accordance with Doni *et al.* (2016); Ginesti *et al.* (2018) and Caputo and Pizzi (2018), and focusing on a specific area of Italy, namely the Lazio region, characterized by a high concentration of companies with “*legality rating*”, this research concerns a sample of 100 “*rated*” companies which, on the date of the last *Agcm* decision, have renewed their “*legality rating*”. In literature, there are numerous studies regarding the positive relationship between CSR and business performance (Torugsa *et al.*, 2012; Wang and Sarkis, 2017), especially by virtue of the ability of CSR to support the generation of value over time (Siltaoja, 2006). However, still little is present regarding the Italian case, and in particular regarding Italian companies in central Italy.

Therefore, using econometric techniques and a panel-type analysis, this work aims to analyze and evaluate the actual impact of the “*legality rating*” on the financial performance of companies included in the sample. The research hypothesis can be expressed as follows:

H_p: Firms who had their “legality rating” renewed in the last Agcm decision had their financial performance improved thanks to the positive impact of this tool.

5. Methodology

5.1. Data collection

The “*legality rating*” is a summary indicator of compliance with high legality standards and was created to promote the introduction of ethical principles in business conduct. It has also a strong rewarding component. The assignment of the rating, of a voluntary nature, is granted free by *Agcm* in collaboration with the Italian *Ministero della Giustizia e dell’Interno*. Therefore, the sample under investigation was extracted from the official database provided by *Agcm*. From a total of 10,208 companies in the database (on 2022/12/31), research led to a sample of 100 “*rated*” companies with the following characteristics:

- legal form: s.r.l. (*limited liability companies*); s.p.a. (often translated as “*joint-stock company*”)⁶;
- operational headquarters located in the Lazio region;
- renewed rating in the latest decision of the *Agcm* (year 2021/2022)⁷;
- “*legality rating*” expiry date between 2022/12/31 and 2024/12/31;
- similar number of employees;
- “*active*” companies;
- financial data present in the *AIDA* database.

Statistics regarding the “*stars*” are present in Tab. 2⁸. By *Agcm*, each company is identified by:

- procedure number;
- fiscal code;
- registered office;
- name;
- rating.

Considered companies are located throughout the Lazio region territory, that shows a high concentration of “*rated*” companies compared to the rest of Italy (*Agcm*, 2022). As shown in Tab. 2, the average rating is equal to 2.51 stars. For the purposes of our analysis, firms’ financial data were provided by *AIDA (Analisi Informatizzata Delle Aziende Italiane)*, a *Bureau van Dijk’s* database, that contains comprehensive financial information on companies in Italy, with up to ten years of history.

⁶ S.p.a.s are more or less equivalent to S.A. or public limited companies (*Plc*) in other Countries.

⁷ As the *Agcm* issues its judgment on the matter every two years.

⁸ For privacy reasons, in this study companies are identified exclusively by “*procedure number*”.

Tab. 2: Sample group of firms

Procedure number	Headq.	Decision date	Decision	Rating	Exp. Date	Procedure number	Headq.	Decision date	Decision	Rating	Exp. Date
RT10045	Fiano Romano (RM)	20/07/2021	Renewed rating	2+	20/07/2023	RT5270	Roma (RM)	14/12/2021	Renewed rating	2+	14/12/2023
RT10165	Roma (RM)	03/08/2021	Renewed rating	2	03/08/2023	RT5328	Roma (RM)	21/09/2021	Renewed rating	1++	21/09/2023
RT10308	Roma (RM)	31/08/2021	Renewed rating	2++	31/08/2023	RT5352	Roma (RM)	08/06/2021	Renewed rating	2+	08/06/2023
RT10318	Roma (RM)	31/08/2021	Renewed rating	2++	31/08/2023	RT5356	Roma (RM)	11/01/2022	Renewed rating	2	11/01/2024
RT10407	Roma (RM)	14/09/2021	Renewed rating	1+	14/09/2023	RT5367	Roma (RM)	14/09/2021	Renewed rating	2+	14/09/2023
RT10409	Roma (RM)	14/09/2021	Renewed rating	1+	14/09/2023	RT5664	Roma (RM)	11/01/2022	Renewed rating	2	11/01/2024
RT10445	Fiumicino (RM)	31/08/2021	Renewed rating	3	31/08/2023	RT575	Roma (RM)	18/05/2021	Renewed rating	3	18/05/2023
RT10466	Roma (RM)	04/11/2021	Renewed rating	1+	04/11/2023	RT5767	Roma (RM)	12/10/2021	Renewed rating	2++	12/10/2023
RT2929	Roma (RM)	04/10/2022	Renewed rating	2++	04/10/2024	RT5971	Roma (RM)	19/10/2021	Renewed rating	1++	19/10/2023
RT2951	Roma (RM)	27/09/2022	Renewed rating	2++	27/09/2024	RT5979	Roma (RM)	09/11/2021	Renewed rating	2++	09/11/2023
RT3090	Roma (RM)	07/09/2021	Renewed rating	3	07/09/2023	RT6239	Roma (RM)	04/11/2021	Renewed rating	1++	04/11/2023
RT3092	Roma (RM)	07/09/2021	Renewed rating	3	07/09/2023	RT6736	Ariccia (RM)	21/12/2021	Renewed rating	1++	21/12/2023
RT3142	Roma (RM)	09/02/2021	Renewed rating	2++	09/02/2023	RT6764	Roma (RM)	07/09/2021	Renewed rating	2	07/09/2023
RT3242	Roma (RM)	27/09/2022	Renewed rating	1++	27/09/2024	RT6797	Roma (RM)	05/07/2022	Renewed rating	2++	05/07/2024
RT3314	Roma (RM)	20/04/2021	Renewed rating	2+	20/04/2023	RT69	Roma (RM)	21/09/2021	Renewed rating	2+	21/09/2023
RT3364	Roma (RM)	18/05/2021	Renewed rating	1++	18/05/2023	RT734	Roma (RM)	11/05/2021	Renewed rating	2	11/05/2023
RT3414	Roma (RM)	15/11/2022	Renewed rating	2+	15/11/2024	RT7393	Roma (RM)	21/06/2022	Renewed rating	2+	21/06/2024
RT3444	Roma (RM)	20/12/2022	Renewed rating	1++	20/12/2024	RT7444	Roma (RM)	20/04/2021	Renewed rating	2++	20/04/2023
RT3542	Roma (RM)	25/05/2021	Renewed rating	3	25/05/2023	RT7563	Roma (RM)	17/05/2022	Renewed rating	3	17/05/2024
RT3565	Roma (RM)	19/10/2021	Renewed rating	3	19/10/2023	RT780	Roma (RM)	30/09/2021	Renewed rating	3	30/09/2023
RT3674	Roma (RM)	27/04/2021	Renewed rating	2	27/04/2023	RT780	Roma (RM)	12/10/2021	Renewed rating	3	12/10/2023
RT3688	Roma (RM)	30/08/2022	Renewed rating	2	30/08/2024	RT7865	Roma (RM)	24/05/2022	Renewed rating	3	24/05/2024
RT3794	Roma (RM)	16/03/2021	Renewed rating	2+	16/03/2023	RT8173	Roma (RM)	22/11/2022	Renewed rating	2	22/11/2024
RT3921	Roma (RM)	08/06/2021	Renewed rating	2+	08/06/2023	RT8519	Roma (RM)	06/12/2022	Renewed rating	2++	06/12/2024
RT3952	Pomezia (RM)	13/04/2021	Renewed rating	1++	13/04/2023	RT8590	Roma (RM)	21/06/2022	Renewed rating	1++	21/06/2024
RT3972	Fiumicino (RM)	16/03/2021	Renewed rating	2	16/03/2023	RT8792	Roma (RM)	18/10/2022	Renewed rating	3	18/10/2024
RT4012	Roma (RM)	20/04/2021	Renewed rating	2+	20/04/2023	RT8827	Roma (RM)	22/11/2022	Renewed rating	3	22/11/2024
RT4042	Roma (RM)	25/05/2021	Renewed rating	2++	25/05/2023	RT89	Roma (RM)	24/01/2023	Renewed rating	2++	24/01/2025
RT4170	ROMA (RM)	14/12/2021	Renewed rating	2+	14/12/2023	RT8930	Roma (RM)	06/09/2022	Renewed rating	2+	06/09/2024
RT4255	Roma (RM)	17/05/2022	Renewed rating	2	17/05/2024	RT8933	Roma (RM)	18/10/2022	Renewed rating	2+	18/10/2024
RT4282	Valmontone (RM)	31/08/2021	Renewed rating	2	31/08/2023	RT8939	Roma (RM)	22/11/2022	Renewed rating	2++	22/11/2024
RT4322	Roma (RM)	18/05/2021	Renewed rating	3	18/05/2023	RT9085	Roma (RM)	02/02/2021	Renewed rating	2+	02/02/2023
RT4333	Roma (RM)	04/10/2022	Renewed rating	2++	04/10/2024	RT9252	Roma (RM)	17/01/2023	Renewed rating	1++	17/01/2025
RT4389	Isdonia Montecelio (RM)	04/11/2021	Renewed rating	1+	04/11/2023	RT9283	Roma (RM)	15/11/2022	Renewed rating	2	15/11/2024
RT4454	Monterotondo (RM)	25/05/2021	Renewed rating	2++	25/05/2023	RT9383	Roma (RM)	16/03/2021	Renewed rating	2++	16/03/2023
RT4460	Roma (RM)	25/05/2021	Renewed rating	2+	25/05/2023	RT9462	Roma (RM)	27/04/2021	Renewed rating	3	27/04/2023
RT4554	Roma (RM)	12/10/2021	Renewed rating	2+	12/10/2023	RT1889	Cisterna di Latina (LT)	02/11/2022	Renewed rating	2+	02/11/2024
RT4606	Roma (RM)	20/12/2022	Renewed rating	2	20/12/2024	RT3255	Cisterna di Latina (LT)	30/11/2022	Renewed rating	2+	30/11/2024
RT4664	Roma (RM)	20/04/2021	Renewed rating	1++	20/04/2023	RT4474	Cisterna di Latina (LT)	21/09/2021	Renewed rating	1++	21/09/2023
RT4822	Roma (RM)	15/06/2021	Renewed rating	2++	15/06/2023	RT5062	Latina (LT)	15/06/2021	Renewed rating	2	15/06/2023
RT4924	Roma (RM)	01/07/2021	Renewed rating	1++	01/07/2023	RT5790	Monte San Biagio (LT)	08/02/2022	Renewed rating	1++	08/02/2024
RT4965	Roma (RM)	13/07/2021	Renewed rating	1++	13/07/2023	RT6257	Latina (LT)	04/11/2021	Renewed rating	2++	04/11/2023
RT4993	Palombara Sabina (RM)	31/08/2021	Renewed rating	2++	31/08/2023	RT6461	Castelforte (LT)	14/12/2021	Renewed rating	1+	14/12/2023
RT5020	Roma (RM)	01/07/2021	Renewed rating	2++	01/07/2023	RT186	Latina (LT)	29/03/2022	Renewed rating	1++	29/03/2024
RT5044	Roma (RM)	02/11/2022	Renewed rating	1++	02/11/2024	RT520	Castelforte (LT)	11/10/2022	Renewed rating	2++	11/10/2024
RT5112	Roma (RM)	08/06/2021	Renewed rating	1++	08/06/2023	RT8175	Latina (LT)	07/06/2022	Renewed rating	2+	07/06/2024
RT5145	Roma (RM)	15/06/2021	Renewed rating	3	15/06/2023	RT3318	Rieti (RI)	20/07/2021	Renewed rating	2+	20/07/2023
RT5167	Roma (RM)	27/07/2021	Renewed rating	2	27/07/2023	RT1884	Viterbo (VT)	15/03/2022	Renewed rating	2	15/03/2024
RT5200	Roma (RM)	13/07/2021	Renewed rating	3	13/07/2023				AVG RATING * =	2,51515	
RT5232	Roma (RM)	13/07/2021	Renewed rating	2++	13/07/2023						
RT5261	Roma (RM)	01/07/2021	Renewed rating	3	01/07/2023						
RT5268	Roma (RM)	14/12/2021	Renewed rating	2++	14/12/2023						

Source: our processing

5.2. “Legality rating” and corporate financial performance

According to previous literature, in order to assess the actual impact of “legality rating” on the financial performance of “rated” companies included in the sample, we implemented a panel data-type regression analysis (Michelon *et al.*, 2013; Wang *et al.*, 2016; Caputo and Pizzi, 2018). Unlike recent Italian study on the matter (Caputo and Pizzi, 2018), that focused its analysis more on firms’ CSR web reporting, and taking into account the studies concerning financial indicators used to assess the sustainability of companies (Lu *et al.*, 2014; Boesso *et al.*, 2015; Mukhambetov *et al.*, 2020), we used a single regression model whose dependent variable is the natural logarithm of *EBITDA* for the reference year, since *EBITDA* is one of the most influential indicator on the market value and is widely used by analysts and investors who use these indicators both to assess the financial position of companies and to determine their value (Awan and Saeed, 2015; Whalen *et al.*, 2015; Bouwens *et al.*, 2019).

Our final panel is characterized by 650 observations, concerning the 100 “rated” companies in the period 2016-2019. The years after 2019 have not been taken into consideration in this study as, due to the *covid-19* pandemic, firms’ performance may have been “distorted”. Since a procedure for estimating the properties of the test, when dealing with specific data, is suggested and should be implemented (Sheytanova, 2004), we used *Hausman’s Specification Test* (Hausman, 1978), in order to evaluate the significance level between estimators (Nerlove, 1971; Arora, 1972) and the presence of endogeneity in the panel model.

5.3. Model design

Our model (namely “*lrm*odel”) envisages the natural logarithm of *EBITDA* as dependent variable (Boesso *et al.*, 2015; Caputo and Pizzi, 2018) and the following independent variables (Tab. 3), selected from the *AIDA* database.

Tab. 3: Variables definitions

Name	Measure
EBITDA	Earnings before interest, tax, depreciation and amortization
LR	"Legality rating" (dummy variable)
LEV	Leverage
FirmSize	Number of employees
ROD	Return On Debt
ε	Error term

Source: *our processing*

So, to test our hypothesis, we employed the following regression specification:

$$lrm_{model}: \ln(EBITDA)_{i,t} = LR_{i,t} + LEV_{i,t} + FirmSize_{i,t} + ROD_{i,t} + \varepsilon_{i,t}$$

where i,t indicate, respectively, firm and year observations, and company performance is measured by *EBITDA*. We included “*FirmSize*” and “*LEV*” as independent variables based on the recommendations and findings of previous researchers (McWilliams and Siegel, 2001; Caputo and Pizzi, 2018; Mukhambetov *et al.*, 2020). For the purposes of our work, we also used the dummy variable, namely “*LR*”, whose value is equal to 0 if the rating is not present and 1 if it is present.

5.3.1. Return On Debt (ROD) as independent variable

A unique feature of our research is the use, as an independent variable, of the *ROD* ratio, namely “*Return On Debt*”, a not so common metric in financial analysis that can be considered as a measure of profitability with respect to a firm’s leverage⁹. *ROD* ratio is also crucial for understanding whether the *ROI* is “adequate” and gives an “indirect” measure of corporate profitability¹⁰. This ratio was included in our model bearing in mind the “legality rating”’s role in banks’ credit granting, and in consideration of the fact that the presence of the rating is instrumentally used to acquire external capital in order to participate in public contracts. In fact, in finance, this indicator is also considered as the average cost of pre-tax third-party means and it is very important for the purposes of assessments of the economic and financial sustainability of the company as a whole.

ROD ratio can be expressed as:

$$ROD = \frac{\text{Financial Charges}}{\text{Debt Financing}}$$

The numerator of the ratio includes charges and interests paid on borrowings, mortgages, bonds, common stocks; the denominator includes the total amount owed to creditors for borrowed capital: bonds, mortgage, financial instruments with maturity and interests on face value.

Specifically, we decided to consider the *ROD* ratio as an independent variable based on its “indirect” influence on *EBITDA*. In fact, considering the *Return On Debt* ratio as an index of onerousness of credit capital, a higher cost of debt corresponds to higher financial charges, and the

⁹ It shows the average cost of money that the company incurs for the use of third-party capital.

¹⁰ The spread between *ROI* and *ROD* expresses the differential between the return on invested capital (*ROI*) and the cost of borrowed capitals (*ROD*).

company is called to commit more of its resources to financial management rather than operational management. Therefore, the fewer resources to invest go to undermine firm's competitiveness, consequentially affecting its *EBITDA*.

6. Results

6.1. Descriptive statistics

After outlining the analysis model, we evaluated its goodness with the R^2 index (coefficient of determination) and the *Hausman test* showed that unobserved individual effects are correlated with the regressors. In this paper, the fixed effect model is then used. To understand the features of our specific data set, we used descriptive statistics (*William, 2006*). Results are reported in Tab. 4.

Tab. 4: Variables' descriptive statistics

Variables (n. 100 sample)	Mean Value	Median Value	St. Dev.	Min. Value	Max Value
EBITDA ('000)	42,1	45	74,2	40,2	1.520
LR	0,106	0	0,31	0	1
LEV	8,1	6	14,5	-17,9	161
FirmSize	22,3	21,1	2,4	12,4	29,2
ROD (%)	11,2	10,9	13,1	1,08	27,47

Source: *our processing*

The analysis showed a maximum value of the dependent variable (*EBITDA*), that is a measure of a business's core profitability after stripping out factors that aren't in the company's control or that may distort earnings, equal to 1.520.000 and a minimum value equal to 402.000. Mean value is instead equal to 421.000. The *ROD* ratio, on the other side, has a max value equals to 27,47%, and a minimum one equals to 1,08%. We can affirm that this ratio places in highlights the average rate of remuneration of the overall borrowed capital. Expressed in percentage terms, it has a range of variability that goes from zero ("*absence of financial charges*") onwards ("*charges gradually increasing proportions*"). The minimum value expected from our sample is therefore close to the minimum limit of this range. Companies whose *ROD* ratio is close to 0 have minimal financial charges that do not divert resources from operational management, and therefore minimally affect *EBITDA*.

6.2. Regression analysis

The main purpose of the research is to analyze the impact of the introduction of the "*legality rating*" on firms' financial performance; mainly, the work aims to evaluate the relationship between the aforementioned rating and financial performance in terms of improvement of the financial indicators of the businesses. Our model was subjected to a goodness test using R^2 index. Results show how the request and the subsequent implementation in the corporate system of the so called "*legality rating*" ("*LR*" in our model) determines a general improvement in firms' performance. What has been said must be understood from the point of view of our model, which presents the natural logarithm of *EBITDA*, for each reference year, as dependent variable. The control variable "*LR*", of a dummy nature, turns out to be statistically significant and with coefficients capable of having a positive impact on the financial balance of the considered firms (Tab. 5).

Tab. 5: Regression results

	EBITDA	
	Coeff.	Sig.
<i>const</i>	-6,022	**
<i>LR</i>	0,990	**
<i>LEV</i>	-0,019	**
<i>FirmSize</i>	1,116	**
<i>ROD</i>	-0,125	**
<i>Hausman Test</i>	5,091*	
<i>R</i> ²	0,871	
<i>Obs. N.</i>	650	
<i>Type</i>	Fix. Eff.	

p* -value is significant at <0.1; *p*-value is significant at <0.001

Source: our processing

Tab. 5 reports the correlations among the variables used. A positive coefficient indicates that as the value of the independent variable increases, the mean of the dependent variable also tends to increase. A negative coefficient suggests that as the independent variable increases, the dependent variable tends to decrease. So, we analyzed how much the mean of the dependent variable (*EBITDA*) changes given a one-unit shift in the independent variable while holding other variables in the model constant. In this way we can evaluate the effects of the rating in isolation from the other variables

“*LR*” variable, identified in our model as “*independent variable*”, positively influences the “*EBITDA*”, similar to the “*FirmSize*” control variable. Regression results show that its coefficient is equal to 0,990. “*ROD*” and “*FirmSize*” variables have, respectively, the following values: -0,125 and 1,116. The interpretation of the coefficients shows a negative effect of the “*LEV*” and “*ROD*” variables on the dependent variable and therefore confirms the negative relationship between *EBITDA* and the “*Leverage*” and “*Return On Debt*” indicators.

The hypothesis expressed earlier in this paper is confirmed, as the analysis shows that the introduction of the “*legality rating*”, an “*Italian CSR tool*”, guarantees an improvement in the financial performance of companies.

Our study confirms what is stated in the existing literature, but in a single Italian region (Lazio) and denotes a positive impact of the rating on the *EBITDA*, which provides a fairer view of how well a business is performing. Companies with the rating, therefore, improve their profitability and their ability to fulfil loan liabilities, consequently improving their competitiveness. The work used the *EBITDA* (precisely, its natural logarithm) as a dependent variable since it is common, for companies, to emphasize it in their statements over net income, because it makes them look better. *EBITDA* is a more accurate measure of profitability because it strips out the effects of a company’s capital structure and tax situation. This makes it a more accurate measure of a company’s true earnings power.

Conducted during a period characterized by a high degree of attention paid by European legislators to the negative externalities related to firms’ collapse, our research affirms that the aforementioned “*legality rating*” is an effective driver in the scope of the different dynamics concerning the financial and economic situation of firms. In the last twenty years, European Member States started to introduce innovative forms of firms’ self-regulations in order to sustain “*honest entrepreneurs*”, and “*legality rating*”, in the context of Lazio region, seems to confirm the positive externalities connected to its adoption.

7. Discussion

7.1. Conclusion

Corporate Social Responsibility represents, in the European panorama, a fundamental paradigm, today, for the creation of corporate value and for regulating the relationship between businesses and stakeholders. The European Commission, since the beginning of the 2000s, has highlighted important innovations in this area, through opinions and directives addressed to companies operating in various economic contexts. After the *2011 CSR Commission strategy*, the European legislator also drafted a document which highlighted the progress made in Europe regarding the promotion of *CSR* and the protection of human rights and environmental sustainability. The main advances concern:

- incentives for businesses to act in compliance with the needs of different stakeholders;
- encouragement to carry out appropriate due diligence along the supply chain;
- greater financial transparency and promotion of a sustainable and ethical finance;
- implementation of good practices and *CSR* tools suitable to ensure efficient business management.

Since 2012, in the Italian territory, the so-called “*legality rating*” represents the best example, on a national scale, of the harmonization process between Italian and European legislation; moreover, the rating represents the ideal output of a change of mentality that makes sustainability and social responsibility its foundations. It represents the possession of high standards of compliance with law and social responsibility, with important requirements and implications from a financial point of view: since its introduction into the national regulatory system, scholars, and above all businesses, have in fact expressed the need to fully understand its potential and its effective applicability to the national context.

The choice of the Lazio region was dictated by two main reasons:

- Lazio is, together with the Lombardy region, the Italian region with the highest concentration of “*rated*” companies. Therefore, our study intends Lazio as a “*virtuous*” region in the *CSR* field;
- at present, there are no studies regarding the “*legality rating*”-“*company performance*” relationship in a well-defined single geographical area. Previous studies consider Italy as a whole.

So, following a critical, and in some ways exploratory perspective, our analysis evaluated the relationship between the introduction of the “*legality rating*” and companies’ financial performance (*EBITDA*). Our model showed a positive correlation between the variables, as the rating guarantees an improvement in the financial performance of considered companies. This demonstrates that *CSR*-related tools, and in particular the Italian rating, combined with a new mentality of the business world, can guarantee better financial performances in line with the needs and requirements of the stakeholders. In this sense, first the European legislator, and then the Italian one, laid the foundations for changing, over time, the *trade-off* between corporate financial results and ethical ones.

Companies should therefore appropriately evaluate the possibility of accessing the benefits of the rating, implementing socially responsible policies within the strategic planning processes, also considering the indirect positive effects that the same can have on company performance and competitiveness in the reference market.

7.2. Research limitations

The main limitation of this research could be the low statistical significance of the sample, closely connected with the unclear and incomplete *CSR*-related data offered by firms. *Agcm*, in fact, offers historical-series databases updated to the latest award/renewal decision and it is up to companies to offer information and details regarding their rating and its effective use, for example, in a public tender or for the granting of bank credit. However, *CSR* and *ESG* issues are still not very

“mature” in Italy, and disclosure in this area is still minimal. This situation, of course, opens the way to future research.

Another limitation concerns the limited comparability of the results concerning the use of the rating, intended as a *CSR* tool, with the results of other European cases. The “legality rating”, in fact, is an instrument exclusively used on the Italian territory and does not have an equivalent tool, with the same characteristics, in other European countries. Future research could fill this gap, finding points of union between the already-present European *CSR* tools, in order to make an appropriate comparison, especially regarding the achieved results.

A further limit is certainly the voluntariness of the rating, very often used for opportunistic purposes and not for its real purpose. Businesses, in fact, could access the tool exclusively to operate within the limits of the law, while, in practice, maintaining unsustainable and unethical behaviour. This variable was not considered in this study, as it is hard to determine and since it is difficult to measure these company conducts.

7.3. Possible developments and managerial implications

The possible developments of the research involve considering a larger sample of “rated” firms. Future research could also look into the role of informal laws and norms as they may offer a different context in which businesses can operate in line with *CSR* behaviours. Furthermore, it would be interesting to make changes to the regression model, considering different variables, in order to evaluate the impact of the rating from different corporate perspectives. For example, future research could integrate variables concerning the unethical behaviour of companies with “legality rating”, in order to conduct a weighted analysis of the inefficiencies and negative impacts of such opportunistic acts.

This research, therefore, lays the foundations for a line of studies that is currently very interesting and offers food for thought for the academic world and management, which are, today, increasingly attentive to *CSR*-related issues. In particular, the study fits into the literature that could be useful for managers to understand how to voluntarily improve their financial performance, in compliance with the high ethical standards required by the European Union.

7.4. Originality of the paper

The paper contributes to the expansion of the literature on the relationship between *Corporate Social Responsibility* and business performance, considering the specific case of the Lazio region, where a high density of companies with “legality rating” can be traced and considers, and consider, in its analysis, the *Return On Debt* ratio as an independent variable, an uncommon indicator in the financial world which however offers important food for thought regarding the health of the companies.

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The sustainability commitment of Made in Italy: a deep dive into the fashion industry sector

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Abstract

Framing of the research. *Pressions from several fronts constrain and stimulates companies to adopt sustainable practices that can be translated into green and social certifications. Careful attention should be paid to real sustainability engagement, which is verifiable, for instance, through certifications.*

Purpose of the paper. *This work aims to analyze the sustainability commitment and the location of companies operating in the fashion industry in Italy, by disentangling between social and environmental sustainability certifications.*

Methodology. *We used data mining techniques applied to data collected from the websites of all the fashion companies located in Italy and registered in the AIDA or ORBIS Bureau van Dijk databases. Data was obtained using Qiba (Quantitas Intelligent Business Analyzer), a web crawling and scraping tool. We adopted a novel content analysis method, which relies on the TF-IDF weighting scheme.*

Results. *Results reveal the existence of a trend towards a strong sustainability engagement, which goes beyond greenwashing. The more companies agree on sustainability principals, the more they also implement concrete actions, and the more they officialize their actions obtaining sustainability certifications.*

Research limitations. *The research could only analyze companies with active websites with their VAT in it.*

Managerial implications. *From a managerial standpoint, this study presents interesting implications for fashion companies looking to increase the effectiveness of their environmental and social sustainability initiatives.*

Originality of the paper. *This study quantifies the sustainability orientation of the Made in Italy companies operating in the fashion industry using original web scraping methodologies and content analysis.*

Key words: *Artificial Intelligence; Data Mining; Fashion; Natural Language Processing; Sustainability; Made in Italy*

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1. Introduction

In recent years, fashion companies are increasingly developing and using eco-fashion (sustainable and ethical fashion) marketing strategies to promote sustainable consumption (Joergens, 2006; Fletcher, 2008; Chan and Wong, 2012). This new trend has been adopted not only by the luxury but also by the high and fast fashion brands, which offer clothing collections that mimic luxury fashion trends, and have been historically considered as representative of an antagonistic concept of fashion (De Angelis *et al.*, 2017; Kapferer and Michaut-Denizeau, 2017; Torelli *et al.*, 2012). As claimed by Kotler (2011), an emergent group of consumers considers sustainability as a key criterion in their consumption choice (the “Lifestyles of Health and Sustainability” - LOHAS market segment. This is prompting fashion companies to develop new business models focused not only on profits but also on social and environmental sustainability. However, caution should be taken when considering these behaviors, which may simply be a form of greenwashing to attract conscious consumers (Blasi *et al.*, 2020). Careful attention should be paid to real sustainability engagement, which is verifiable, for instance, through certifications.

With more than 100 (McKinsey & Company, 2022) to 150 (World Economic Forum, 2021) billion items of clothing produced each year, the global fashion industry has registered a period of unprecedented growth. Clothing production, which represents the largest application of textiles, have at least doubled since the beginning of the millennium, while utilization has drastically plummeted, meaning most garments are discarded when they are still massively underutilized (Ellen MacArthur Foundation, 2017).

Regarding this context, this work aims to analyze the sustainability commitment of companies operating in the fashion industry in Italy, by disentangling between social and environmental sustainability certifications. The objective is to answer the following research questions:

RQ1: Do fashion companies operating in the Made in Italy commit to sustainability? If so, to what extent?

RQ2: Can we differentiate between weak (mainly greenwashing) and strong (actions and certifications) sustainability commitment?

RQ3: Is there any difference in the commitment toward social and environmental sustainability?

RQ4: Is there a preferential attachment of sustainable companies to some specific locations?

To do so, we used data mining techniques applied to data collected from the websites of all the fashion companies located in Italy and registered in the AIDA or ORBIS Bureau van Dijk databases. Data was obtained using Qiba (Quantitas Intelligent Business Analyzer), a web crawling and scraping tool. We adopted a novel content analysis method, which relies on the TF-IDF weighting scheme, a commonly used tool in information retrieval. Among the existing TF-IDF versions, we implemented that proposed by Paik (2013) because it allowed us to consider documents of different lengths.

2. Sustainable Fashion

In a nutshell, sustainable fashion can be interpreted in two main ways, by the consumers view and by the brands view. Those two spheres contain a complex world inside. Consumers have motivations to buy in a certain way and to discard in a certain way (Morgan and Birtwistle, 2009), they are part of communities of consumption that can be pro-environmental (Bekein *et al.*, 2007) or hedonic (Hirschman and Holbrook, 1982) etc. By the other hand, brands are just a small piece of production and distribution engine, composed by companies, supply chain, regulations, trends etc. With the issues caused by consumerism, consumers and brands are more aware about the negative externalities caused by the fashion industry.

Due to phenomena as fast-fashion, it has been estimated that, in 2018, the fashion industry was responsible for 2.1 billion tons of emission, accounting for around 4% of the global total, although other studies report that this figure could even be near 8-10% (United Nations, 2019). According to

the World Economic Forum and Boston Consulting Group (2021), the industry is also one of the eight supply chains responsible for more than 50% of overall global air pollution. Around 70% of this negative impact has been attributed to upstream activities, such as energy-intensive raw material production (38%, the most polluting phase overall), followed by preparation and processing of inputs. Regarding the remaining 30%, product use, with more than 420 million tonnes CO₂Eq, held the top spot among the downstream and end-of-use stages (Global Fashion Agenda and McKinsey & Company, 2020).

Regarding this self-destructive scenario, it is paramount for the maintenance of life on Earth that consumers change their habits and strategic for brands to change the way they produce fashion. The biggest impact for widespread sustainability in the clothing industry was believed to be a customer's prerogative (Joergens, 2006). For this reason, increasing their knowledge about the fate of clothing through the life cycle and about greener alternatives and practices (Claudio, 2007) are both key steps for widespread sustainable fashion adoption, which is still very much a niche segment.

There appears to be a consensus on the factors which trigger the adaptation of sustainability by focal companies (then passed on to their suppliers and other members of the chain): legal demands and regulations, top management commitment, customer demands, compliance and response to stakeholders (e.g. government and NGOs) and creation of a competitive advantage are among the main pressures and incentives (Caniato *et al.*, 2012; Li *et al.*, 2014; Seuring and Müller, 2008) to which de Brito, Carbone and Blanquart (2008) also add cost driven motivations.

Obvious changes at the organizational level, both inside companies and along the supply chains, come with the adoption of a greener approach (de Brito, Carbone and Blanquart, 2008). Seuring and Müller (2008) also highlight three distinctive features of sustainable supply chain management: indeed, these firms deal with a wider range of issues (causing them to have to take into account a longer part of the supply chain), with an higher number of performance objectives (especially the ones related to environmental and social sustainability) and with an increased need for cooperation with other partners of the chain - also found by Li *et al.* (2014), Todeschini *et al.* (2017), Turker and Altuntas (2014) and to which de Brito, Carbone and Blanquart (2008) added that the broadening of the number of stakeholders also requires the adoption of coordination methods for dealing with different needs and claims.

Since sustainable innovation has traditionally been driven by the supply side, specific attention has been placed on that part of the chain: not only the sourcing of raw, semi-finished and finished materials, but also the relocation of production sites from Europe to developing countries with lower labour and input cost, has posed particular challenges, financial and reputational threats, since social and environmental conditions in these nations are not as tight as in developed countries (Caniato *et al.*, 2012; Niinimäki and Hassi, 2011; Seuring and Müller, 2008; Todeschini *et al.*, 2017; Turker and Altuntas, 2014).

3. Empirical Settings

3.1 The Fashion Industry: A focus on the Italian excellence

The Italian fashion industry is fragmented, showing meaningful differences when it comes to profit margins. If for brands, they are usually higher but volatile, in the case of supply chains these are lower but much more stable (Ambrosetti, 2022a). Also, there is a myriad of micro, small and medium firms and they tend to cluster in specific locations, allowing the fragmentation to be recomposed within the industrial districts, a peculiar - but not exclusive - reality, which has proven to be crucial for the development and the international leadership of typical Made in Italy industries, as fashion.

Industrial districts are small and medium enterprises (SMEs)-based, with firms specialized in one, or few, specific phase of the same production process common in the district (Becattini, 1989),

making each company interdependent and functional to the others, rather than stand-alone, isolated entities. This creates a privileged access to a local labor market endowed with specific skills (Sforzi, 2008) and able to exploit the presence of significant external economies (e.g., learning, creativity, specialization).

The division of labor, by combining external economies with specialization, leads to large but dis-integrated organizations able to achieve economies of scale (cost advantages due to higher efficiency and capacity) without having to give up the quality and customization typical of craftsmanship. Regarding the more social aspect, the values of the local communities and their sense of belonging to the places where production is located is one of the most distinctive elements of Italian industrial districts: the intertwine of work and family life leads to an integrated system of shared values and collective identities that facilitates trust, communications, and collaborative relationships.

For the period 2018-2020, ISP estimated the existence of 159 industrial districts, divided into five different sectors. The “Sistema Moda”- indicated in green - is composed by 5929 companies distributed among 41 districts, with 64% of them belonging to textiles, clothing, and footwear sectors. Regarding their geographical distribution, Toscana, Veneto, Marche, and Lombardy clearly emerge as the regions with the highest concentration of fashion-related industrial districts. Worth mentioning, because of their size (proportional to the 2020 turnover and the number of companies composing the district) are the following ten groupings in Table 1.

Tab. 1: Industrial districts by specialization in Italy

Industrial districts	Specialization
Orificeria di Arezzo (112)	“the city of gold”, it is one of the world’s most famous jewelry capitals
Tessile e abbigliamento di Prato (148)	one of the largest in Europe, with each firm within the district specialized in one of the stages of textile manufacturing (spinning, warping, weaving, dyeing, trimming, and finishing)
Calzature di Fermo (23)	in the provinces of Fermo, Ascoli Piceno and Macerata is located the largest concentration of footwear companies in Italy, specialized in the production of shoes components. It is characterized by the presence of few leading companies - like Tod’s and B.A.G (NeroGiardini) - and a high number of smaller companies (Intesa Sanpaolo, 2021c)
Pelletteria e calzature di Firenze (123)	this district is famous for its high-quality leather goods, that range from footwear to bags, wallets, belts and suitcases. Both global luxury brands (such as Gucci, Ferragamo, LVMH, Yves Saint Laurent, and Balenciaga) and small and medium-sized local businesses can be found in the area (Intesa Sanpaolo, 2021a)
Occhialeria di Belluno (108)	since the opening of the first factory in Calalzo di Cadore in the late 19th century, the district - which produces every type of eyewear components - has been one of the highest expressions of quality, design and innovation. In this area not only a myriad of micro-enterprises is located, but also some of the world’s leading companies, like Luxottica and Safilo.
Concia e Calzatura di Santa Croce sull’Arno (42)	one of the largest tanning districts in Europe, also characterized by its close collaboration with the nearby Pelletteria e calzature di Firenze district.
Concia di Arzignano (40)	between Vicenza and Verona, it comprehends a complete and integrated supply chain - from tanning to recycling - that serves the automotive, furniture and fashion industries.
Tessile di Biella (145)	high-end yarns and textiles, such as wool and noble fibers, obtained from sheep breeding.
Calzatura sportiva e sportssystem di Montebelluna (18)	specialized in sports equipment and footwear (Sammarra and Belussi, 2006), it has a long history of innovation - also being, among the leather districts, the one with the highest number of patents. Geox S.p.a., Stonefly S.p.a. and Garmont S.r.l. are some of the most important companies in the area (Intesa Sanpaolo, 2021a).
Seta-tessile di Como (139)	all processes of the silk textile chain - twisting, weaving, dyeing, printing, finishing - are present in the province, making it a region known worldwide loved by many luxury brands.

Source: Intesa Sanpaolo.

In the period 2008-2019 industrial districts, in particular the ones belonging to the fashion sectors, did perform significantly better than non-district areas in terms of turnover (Intesa Sanpaolo, 2021b). However, already in 2019, many sectors related to the fashion system, in particular textiles, clothing, footwear (-3.7%), tanning (-5.6%), knitwear and eyewear, were recording a negative performance; only goldsmith (+5.5%), leather goods (+1.7%) and sporting goods (+1.5%) were able to register some growth, though not sufficient to make up for the setbacks suffered by the other segments (Intesa Sanpaolo, 2021b). Indeed, the only fashion district that could compete with the other categories in terms of growth, profitability and capitalization was Oreficeria di Valenza (Intesa Sanpaolo, 2021b).

Regarding ROI (Return on Investment), significant drops for companies of any size were recorded in the 2018-2020 period. Moreover, no relevant differences between district and non-district areas were underlined (Intesa Sanpaolo, 2021b), only a general, common negative trend for the period 2008-2019, even more substantial when 2020 is included: indeed, the 2008-2020 gap for non-district areas has been found to be equal to 3.2 percentage points, whereas it is only 2.8 percentage points for district areas. Even if the drop has been more pronounced for the former, non-district areas have recorder better ROI and EBIT margins (considering them in absolute terms) than districts during the three-year period from 2018 to 2020; moreover, when comparing the 2008 and 2020 Return on Investment, it must be mentioned that the “Sistema Moda”, with a - 4.3 percentage point difference, recorder a considerable negative performance (Intesa Sanpaolo, 2022).

On a final note, “Sistema Moda” districts present a higher degree of internationalization, measured by the number of foreign enterprises in the area, than all the other industries. For example, Tessile e abbigliamento di Prato holds the top spot in the overall standing, with 124 foreign companies accounting for 14,6% of the total businesses located in the district (Intesa Sanpaolo, 2022).

3.2 Challenges for sustainability in Fashion Industry

Even if it could appear counterintuitive, natural materials are not necessarily the better, greener option and, paradoxically, polyester is sometimes marketed as more sustainable than cotton and wool, since it requires much smaller quantities of water - the global average water footprint for 1kg of cotton is 10,000 liters (Freitas, Zhang and Mathews, 2017), whereas producing 1kg of polyester is said to use little to no water (Fletcher, 2008) - and no use of pesticides to be produced. Nevertheless, manufactured fibers are the result of an extremely energy-intensive and polluting process, and the laundering of these types of materials has been found to be particularly detrimental for the environment, since they shed microplastic fibers that end up in seawater (European Commission, 2022c).

For these considerations, many fashion brands have started to introduce “greener” alternatives, such as organic cotton (not only beneficial for the environment, but that also characterized by a strong social element, linked to Fair Trade and ethical production), and sustainable synthetics (e.g. Econyl®, obtained through the recycling and purification process of ocean and landfill waste by Italian company Aquafil for brands like Prada, Stella McCartney and H&M), that will require significant technological innovations in order to scale their commercial viability.

4. Methodology

4.1 Data

In this research, the focus is on the fashion industry, “one of the greatest carries of Made in Italy worldwide” (Campagna Abiti Puliti, 2022), that comprehends not only “*moda* (fashion)”, but also “*gioielli* (jewelry)” and “*occhiali* (eyewear)”.

Data for the “fashion” segment were collected from AIDA, whereas, in the case of the “jewelry” and “eyewear” sectors, ORBIS has been the chosen source. Both created and powered by Bureau van Dijk (a Moody’s Analytics Company), AIDA is a database of comprehensive financial data of Italian companies, while ORBIS is one of the most powerful comparable data sources on millions of private companies and other entities worldwide.

4.2 QIBA (*Quantitas Intelligent Business Analyzer*)

QIBA is a web crawling and scraping tool developed in Python by Quantitas srl, it is a data enrichment solution based on Machine Learning and AI capable of exploring the World Wide Web, allowing its users to obtain a great volume of significant, relevant information about specific companies (Toschi *et al.*, 2019).

To do so, the software follows a three-step process: starting from uploaded companies’ information (the minimum being the business names and VAT numbers, in this case derived from AIDA and ORBIS), QIBA operates the Web scanning process, analysing each webpage to extract different types of information (ranging from keywords connected to products and services to certificates), then presented and structured by the program to make them more accessible and easier to interpret.

4.3 The Data Cleaning Process

To corroborate if QIBA had correctly identified each company’s website and to correct possible mistakes (for example, the inclusion of online journals in place of the right website), an in-depth data cleaning process, broken down in several steps and repeated various times, has been performed. In particular, this phase of data pre-processing entails removing duplicate, incorrect and erroneous data from the original dataset, to obtain a correct, complete, usable and consistent database (Agarwal, 2013).

Starting from a list of more than 2400 companies, 178 redundant entries were identified and removed, giving priority, as selection criteria, the one with the most recent turnover data. Then, a number of critical cases which required to be manually verified were identified base on the proprietary algorithm of the software, Index2, that assigns a score from 0 to 2 reflecting the goodness of search results (Toschi *et al.*, 2019).

In particular, the 42 entries with an Index2 < 0,8 were double-checked: only for 18 of these companies, QIBA had associated the right website and, regarding the rest, in four cases it was possible to identify and associate the correct company website. Along with data cleaning, data integration is also a necessary step to perform (Agarwal, 2013). Hence, all the 364 companies for which a website was not indicated were controlled, finding that 154 companies did have a websites QIBA had not been able to detect.

Checking the 103 entries with an Index2 ranging from 0,8 to 1,5, 39 turned out to be incorrect, and for 15 of these companies the right website was found and integrated. Then, the almost 300 companies with Index2 = 2 (the highest score) presenting either the “PIVA UNCERTAIN” or the “NO PIVA” Warnings (respectively, VAT numbers not certain or not included in the websites) were also controlled, most of them presenting the correct website. On the topic, it must be mentioned that despite current regulation - Article 35 of the Decree of the President of the Republic 633/1972¹ and subsequent updates, the new 2001 formulation - requiring companies to indicate the VAT number in their own website, a small but sizable minority of companies still do not comply with this law.

As a last step, because of their relevance and to obtain the most complete and representative database of fashion companies, a total of 13 companies were also integrated in the final list. After

¹ Source: Decreto del Presidente della Repubblica del 26/10/1972 n. 633, Art. 35. Available at: <https://def.finanze.it/DocTribFrontend/getAttoNormativoDetail.do?ACTION=getArticolo&id={75A4827C-3766-4ECC-9C45-00C8D6CDC552}&codiceOrdinamento=200003500000000&articolo=Articolo%2035>

the inclusion of these companies and all the corrections mentioned above, the list was analyzed by QIBA and since, after the analysis, 43 erroneous results were still included in the final list, these were eliminated before re-running the web scraping process, obtaining at the end the most satisfactory result. However, and on a final note, it must be said that for a list of businesses for which a website had been manually found, QIBA could not obtain relevant information, the main reason and most frequent case usually being these websites being built in JavaScript and publicly display little to no text in HTML tags.

4.4 Baskets of Words

Information retrieval systems are designed to find documents relevant to a specific query in a document collection (Hiemstra, 2000), also allowing to rank them, from most to least pertinent, by comparing the words of the selected query with the terms present in each document.

Assuming their ability to describe and identify a certain topic, the first, fundamental step is choosing the most appropriate terms composing the basket of words (the query). In this case, a hybrid approach was adopted by applying a two-step procedure, starting from a qualitative lexicon-based approach based on current literature. This initial, manual selection was then enriched and expanded using the *word2vec* package from R, a method for producing word embeddings (Mikolov *et al.*, 2013).

Because of the complex and broad nature of the concept, to properly represent the various facets of sustainability and to perform the most accurate and detailed analysis possible, it became necessary to draw up more than just one basket of words, one for each sustainability subtopic identified. The final list of selected keywords is composed of 249 terms, which were then categorized into the four distinct groups of “Green sustainability”, “Social sustainability”, “Certifications”, “Sustainability” (Table 2).

Tab. 2: Description of the four baskets of words

Basket	Description
Green sustainability	Green sustainability covers themes related to environmental sustainability.
Social sustainability	Social sustainability is about identifying and managing business impacts, both positive and negative, on people.
Certifications	Standards and certifications adopted to demonstrate commitment to good environmental, social, ethical practices.
Sustainability	Regarding sustainability in its broader sense (for example, all the SDGs have been included).

Source: our elaboration.

4.5 TF-IDF (Term Frequency - Inverse Document Frequency)

In order to assess the strength and extent of Italian fashion companies’ sustainability commitment, one of the most popular term-weighting schemes, the TF-IDF (Term Frequency - Inverse Document Frequency) has been adopted, because is essential to the study of information retrieval systems (Paik, 2013). More specifically, this measure consists of two components: the Term Frequency (TF) and the Inverse Document Frequency (IDF).

The TF, that measures how frequently a word appear in a document, is characterized by it following three key hypotheses: the Advanced TF hypothesis (a modified TF hypothesis that proposes that the rate of change of a word’s weight should decrease as TF increases), the Document Length Hypothesis (that regulated the TF value to consider that, in longer documents, terms are likely to be used more frequently than for shorter documents) and the Term Discrimination Hypothesis (for which documents containing rarer terms should be preferred). In this case, the TF also includes the relative intra-document TF (RIFT), more effective for shorter queries, and the length regularized TF (RLTF), that performs better on longer queries (Paik, 2013).

The other component, Inverse Document Frequency, assigns higher scores to documents containing rare, uncommon terms in the collection, offsetting the weighting of the TF component on the assumption that some terms can naturally appear frequently in a text, making them less unique identifiers (Paik, 2013)

As just mentioned, considering many different versions of this measure exist and the need to choose the most suitable one, combining the TF-IDF with document length normalizations, as proposed by Paik (2013), has been found to be the most effective when dealing with documents of various lengths - since it includes the two different within-document TF normalizations, which are then combined to obtain the final weight - allowing to obtain the most accurate retrieval result (Hiemstra, 2000).

5. Data analysis and discussion

QIBA, after operating the web scraping process on the selected 2204 fashion companies' websites, returned TF-IDF values which allowed for the ranking of these businesses according to the four baskets of words, knowing that that the higher the score, the higher the discussion about sustainability topics on the website.

From the 2204 companies considered in the final list, environmental sustainability (basket 1) related words were the dominant ones, being present in 1277 of the websites (58% of the total), followed by social sustainability (basket 2) with 916 of companies mentioning these themes, sustainability topics (basket 4) discussed by 830 (807) businesses (38%) and certifications, only included by 764 companies (35%). Moreover, it was found that several businesses (251) only discussed environmental sustainability topics, 23 companies deepened social themes alone, 26 only talked about their certifications but none of the companies in the sample just considered sustainability as it was articulated in basket 4.

This data suggests a moderate-to-high commitment, especially when focusing on the subtopic of "green sustainability", even though it is also the basket with more words, the considerable better results obtained in are in line with the conversation on this aspect being the most developed out of the four themes considered.

The boxplot (Figure 1), also known as box-and-whisker plot, is a useful graphical method for showing the distributions of numeric data values also belonging to multiple clusters, allowing to quickly compare characteristics such as symmetry, skew, variance, and outliers.

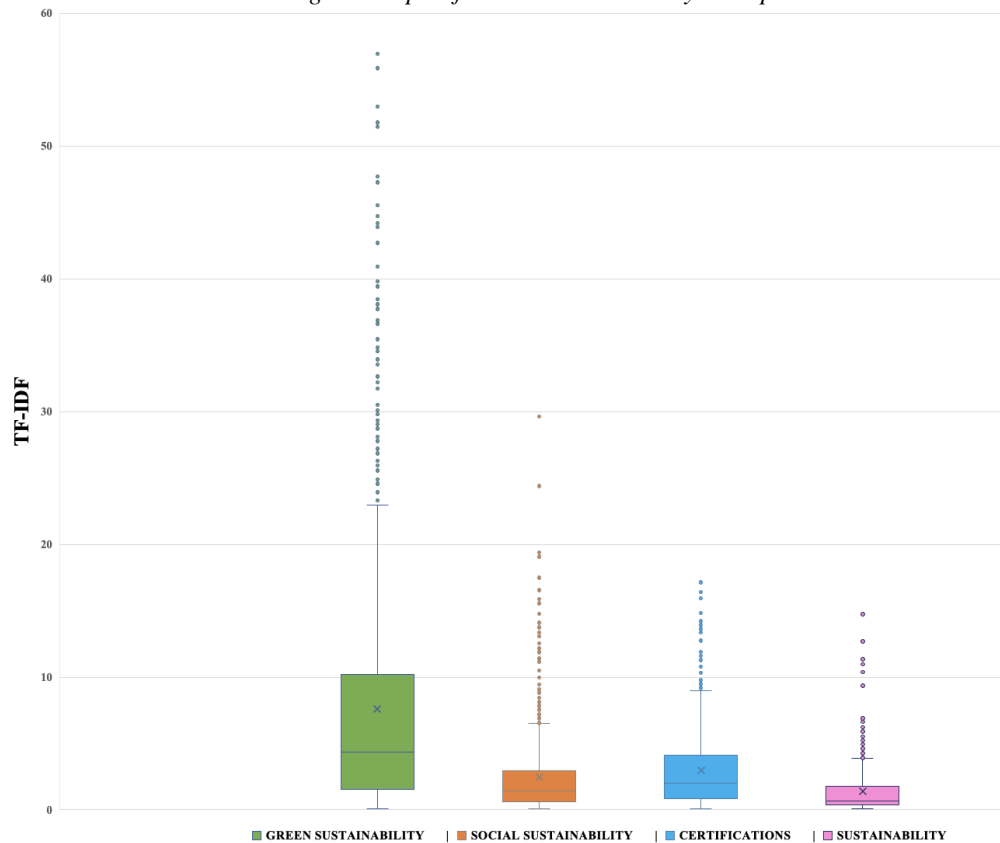
About green sustainability, the subtopic in which the higher percentage of companies has performed the best overall (the first 50 TF-IDF results are all from basket 1), it is also the one where the highest TF-IDF values were recorded. In fact, its average score is equal to 7.02 whereas, for the other baskets, this value is significantly lower: 2.29 for "Social Sustainability", 2.47 for "Certifications" and 1.27 for the fourth "Sustainability" basket.

Since for all four distributions the median is closer to the bottom and the whiskers are shorter on the lower end of the box, they can be classified as positively (or right) skewed, also resulting in the mean (represented by the "X") being higher than the median (the average value indicated by the line dividing the box in two parts).

"Green Sustainability" has shown the greatest degree of dispersion (visually indicated by the two ends of the whiskers), followed by the "Certifications", "Social Sustainability" and "Sustainability" categories.

Also, a significant number of outliers (observations numerically distant from the rest of the data) was found, especially in the case of basket 1: these businesses can be seen as "sustainability champions", whose commitment is significantly greater than the average company.

Fig. 1: Boxplot for each Sustainability subtopic



Source: our elaboration.

Lastly, from the analysis it emerged that textiles businesses, manufacturers of high-quality yarn (cotton and other fabrics) and suppliers of input materials for other brands of the value chain are the type of company which recorded the best scores overall. For example, focusing on the top 20 of the “Green Sustainability” category, only three enterprises - Sacchettificio Toscano S.r.l., CadicaGroup S.r.l. and Kering Italia S.p.A - operate in sectors different than textile, the first two dealing with packing and labelling and Kering Italia S.p.A. being the first luxury global brand appearing in the list. Also, still focusing on the first 100 results of basket 1, only one company - Karizia S.p.A., a jewellery business - is from one of the other two categories considered in the analysis. Nevertheless, considering the other three subtopics, the variety is certainly higher, with numerous companies being either from the eyewear or jewellery sectors. In particular, the “Sustainability” basket is the one showing the highest variety, with the best performing geographical area being the ones where eyewear and leather goods companies are located.

5.1 Regional Analysis

The best performing companies overall are in the regions of Trentino-South Tyrol (in Italian: Trentino Alto-Adige), Lombardy, Piedmont (in Italian: Piemonte), Abruzzo and Basilicata. Trentino-South Tyrol ranks 1st in both “Green Sustainability” and “Certifications”, whereas Friuli-Venezia Giulia and Basilicata are the most virtuous when it comes to social and sustainability topics respectively (Table 24). These three regions do not have a long history when it comes to the fashion industry since, as stated in Paragraph 2.3, districts have been known to be in different provinces and municipalities of Lombardy, Marche, Piedmont, Tuscany, and Veneto.

Indeed, the outstanding results obtained by several companies located in Lombardy (as presented in Paragraph 4.2.3, three out of the four best performing companies for each basket are based in this region) were diluted by the other numerous businesses with medium and low scores, while Basilicata and Friuli-Venezia Giulia, presenting only one or few businesses but with impressive

results, when computing the average of TF-IDF values, in the end obtained higher average values. For this reason, in the Table 24, the number of companies for each region (and for each basket of words) that were considered when calculating the scores has been indicated in brackets.

However, Lombardy is indeed the region with the highest number of provinces considered in the analysis, followed by Tuscany, Piedmont, Veneto, Marche, Apulia, and Campania, confirming previous statements regarding the diffusion of many small-medium companies producing for the fashion industry in these territories.

Tab. 3: Average TF-IDF values by Italian region

	BASKET 1 “Green Sustainability”	BASKET 2 “Social Sustainability”	BASKET 3 “Certifications”	BASKET 4 “Sustainability”
Abruzzo	9.35 (18 companies)	3.54 (13 companies)	2.34 (12 companies)	1.29 (13 companies)
Aosta Valley	-	-	-	-
Apulia	4.31 (35 companies)	1.73 (22 companies)	2.00 (17 companies)	0.75 (24 company)
Basilicata	7.58 (3 companies)	0.94 (2 companies)	3.28 (1 company)	2.23 (1 company)
Calabria	8.06 (1 company)	0.79 (1 company)	1.48 (1 company)	1.13 (1 company)
Campania	5.67 (31 companies)	1.97 (24 companies)	2.29 (20 companies)	0.79 (22 companies)
Emilia- Romagna	5.43 (80 companies)	2.34 (55 companies)	2.56 (35 companies)	0.79 (50 companies)
Friuli-Venezia Giulia	9.15 (11 companies)	4.50 (9 companies)	2.01 (10 companies)	1.26 (8 companies)
Lazio	4.75 (18 companies)	2.61 (11 companies)	1.06 (10 companies)	1.74 (10 companies)
Liguria	9.84 (1 company)	0.55 (2 companies)	2.79 (2 companies)	0.47 (2 companies)
Lombardy	9.80 (353 companies)	2.51 (257 companies)	3.73 (241 companies)	1.57 (241 companies)
Marche	4.30 (57 companies)	2.47 (29 companies)	2.09 (20 companies)	1.58 (23 companies)
Molise	0.41 (1 company)	-	-	-
Piedmont	8.15 (99 companies)	2.78 (70 companies)	3.01 (66 companies)	1.50 (62 companies)
Sardinia	-	-	-	-
Sicily	10.44 (1 company)	-	-	1.20 (1 company)
Trentino-South Tyrol	10.97 (16 companies)	3.54 (9 companies)	4.08 (10 companies)	1.36 (11 companies)
Tuscany	7.60 (269 companies)	2.18 (203 companies)	2.95 (159 companies)	1.41 (186 companies)
Umbria	3.91 (14 companies)	1.78 (9 companies)	1.39 (8 companies)	0.90 (10 companies)
Veneto	6.62 (270 companies)	2.47 (200 companies)	2.42 (152 companies)	1.29 (165 companies)

Source: our elaboration.

No fashion companies were detected in Sardinia (in Italian: Sardegna) and Aosta Valley (in Italian: Valle d’Aosta) and, subsequently, no TF-IDF values are present. Fr Molise only a score for the environmental commitment is presented and, in the case of Sicily, social sustainability and certifications topics did not come up during the analysis.

5.2 A Focus on Provinces

In this section, a detailed analysis of the sustainability commitment of Italian provinces is presented in four different map charts, one for each subtopic (green, social, certifications, and

sustainability in general) and with the colour gradient signalling the progression from the highest to lowest TF-IDF scores, enabling, in this way, data comparison.

Regarding the methodology, the addresses, municipalities, provinces, and regions of the companies' registered offices were extracted from the AIDA and ORBIS databases (or, when not indicated, manually found), for then averaging the TF-IDF scores for each province (these values are the ones presented in the maps).

It was decided to investigate sustainability at the provincial level, the second-level administrative divisions in Italy, since this unit represents the perfect balance between the level of detail required for this analysis to be meaningful and representative of geographical differences (which would not be possible by focusing only on regions) but still not so granular, like it would happen with municipalities, to not be able of providing a clear representation (also due to Excel constraints) and identifying correspondences with areas where industrial districts are located.

Moreover, since this study has dealt with the topic of industrial districts and the role small and medium-sized companies populating these special areas played in the flourishing of *Made in Italy* fashion, it was chosen not to exclude any firms (even if very small) when calculating the average values, mainly to obtain a more realistic and accurate picture of each province, to operate in the most consistent way possible and to highlight if, precisely because of nature and characteristics of industrial districts, being part of these agglomerations has been affecting the sustainability performance of these businesses.

5.2.1 Green Sustainability (Basket 1)

Environmental sustainability is the subtopic showing the highest variability out of the four considered. In this case, Gorizia (Friuli-Venezia Giulia), Livorno (Tuscany), Matera (Basilicata), Como (Lombardy), Chieti (Abruzzo), Varese (Lombardy) and Trento (Trentino-South Tyrol) were the provinces which achieved the top 10% TF-IDF scores (Figure 35).

Focusing on the companies located in these territories, it emerged that most of them are from textile sector, producing yarns, fibres, and fabrics for either the fashion industry or others.

The highest result was scored in Gorizia, province where Miko s.r.l.², a non-woven fabric manufacturer, has based its head office. The company pride itself on the sustainability of what it produces, discussing and reporting in detail how it measures, at every stage of the life cycle, the environmental impact of its products. What it is interesting to highlight is that Miko s.r.l. is the same company which was subject of the first Italian greenwashing controversy (as mentioned in Paragraph 3.4): however, from this analysis, it emerged that Miko s.r.l. scores well also on the certifications point of view.

Also, producers of non-woven fabrics are companies located in Livorno and Matera; in Como (Silk-Textile District of Como Lake) Varese and Trento, unlike previous provinces, a much more significant number of companies is based; nevertheless, also in this case, the businesses belong to the textile industry.

The area around Chieti (Clothing District of Northern Abruzzo) is specialized in different stages of clothing production, from yarn manufacturing to the production of finished products: C.T.Point S.p.A.³, the best performing company of this province, is a manufacturer of monofilament polyester and nylon yarns, Confezioni Mario De Cecco SpA⁴ produces dynamic workwear, and Dylon Manufacturing Technology⁵ deal with both the manufacturing and R&D aspects associated to garment production.

Common sustainability-related practices detected during the analysis concern the collection of post-consumer garments, the recycling and reusing of textiles, the accurate selection of suppliers of innovative, high-quality, and low impact raw materials and the constant monitoring and reporting of the effects of measures implemented.

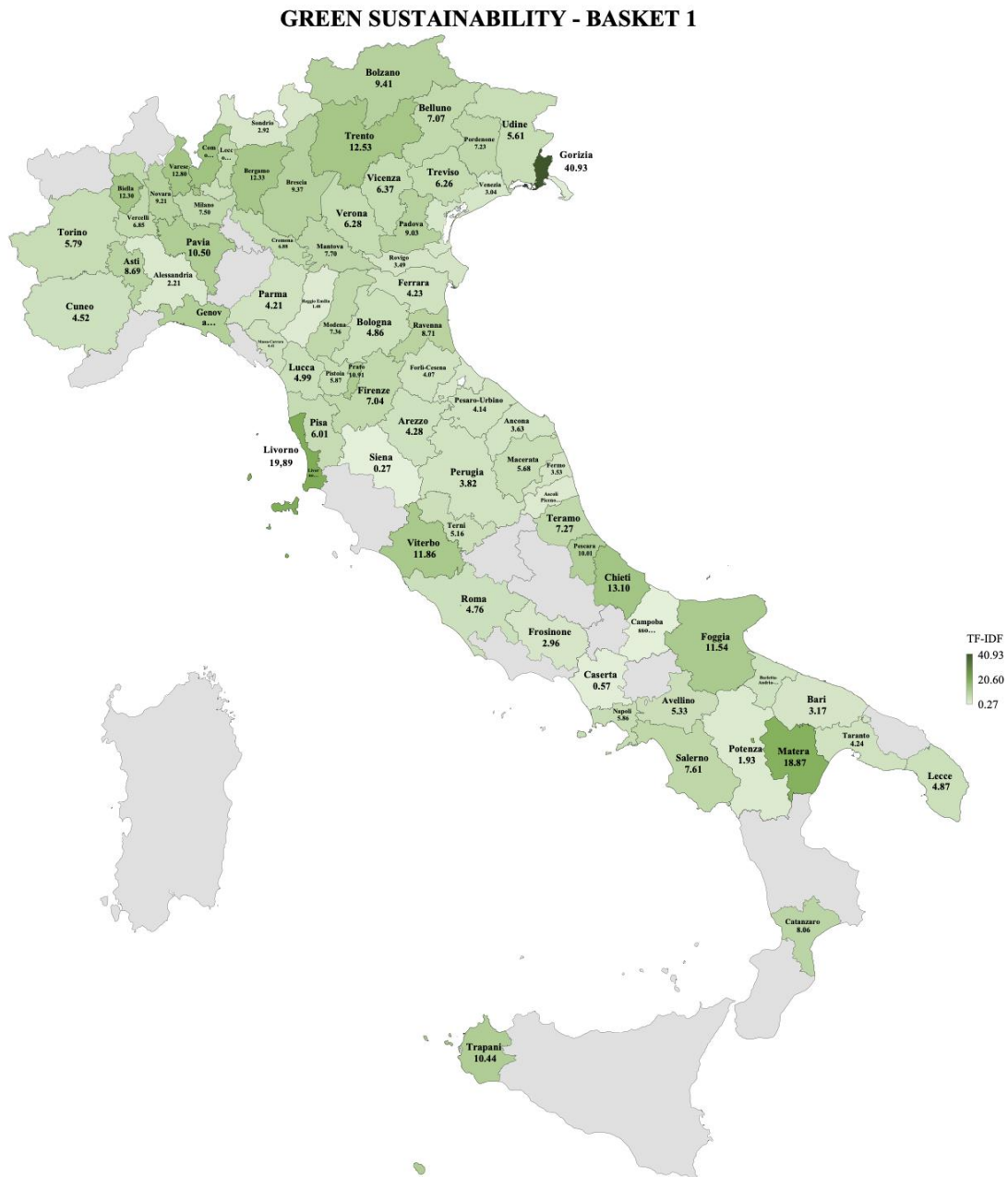
² Source: Dinamicamiko. Available at: <https://dinamicamiko.com/en/>

³ Source: C.T. POINT - 100% Filati Made in Italy. Available at: <https://www.ctpoint.it/en/home/>

⁴ Source: Mario De Cecco, abbigliamento da lavoro. Available at: <https://www.dececco.net/en/>

⁵ Source: Dylon Manufacturing Technology. Available at: <https://www.dylan.com/?lang=en>

Fig. 2: Average “Green Sustainability - Basket 1” TF-IDF scores for every Italian province



Source: our elaboration.

5.2.2 Social Sustainability (Basket 2)

As affirmed by the United Nations, the social sustainability deals with how a company manages the impact it has on its stakeholders, them being employees and workers of the value chain or customers and local communities⁶. The analysis highlights social sustainability discussion to be much less developed than green/environmental themes. The best performing companies, with regard to social responsibility, are located in Viterbo (Lazio), Gorizia (Friuli-Venezia Giulia), Pordenone (Friuli-Venezia Giulia), Avellino (Campania), Trento (Trentino-South Tyrol), Fermo (Marche) and Udine (Friuli-Venezia Giulia).

Leather goods and textile districts emerged as the ones where the conversation around social sustainability was found to be more developed: the continuous improvement, safety, and respect of the human rights of workers and the development of local communities are among the most cited

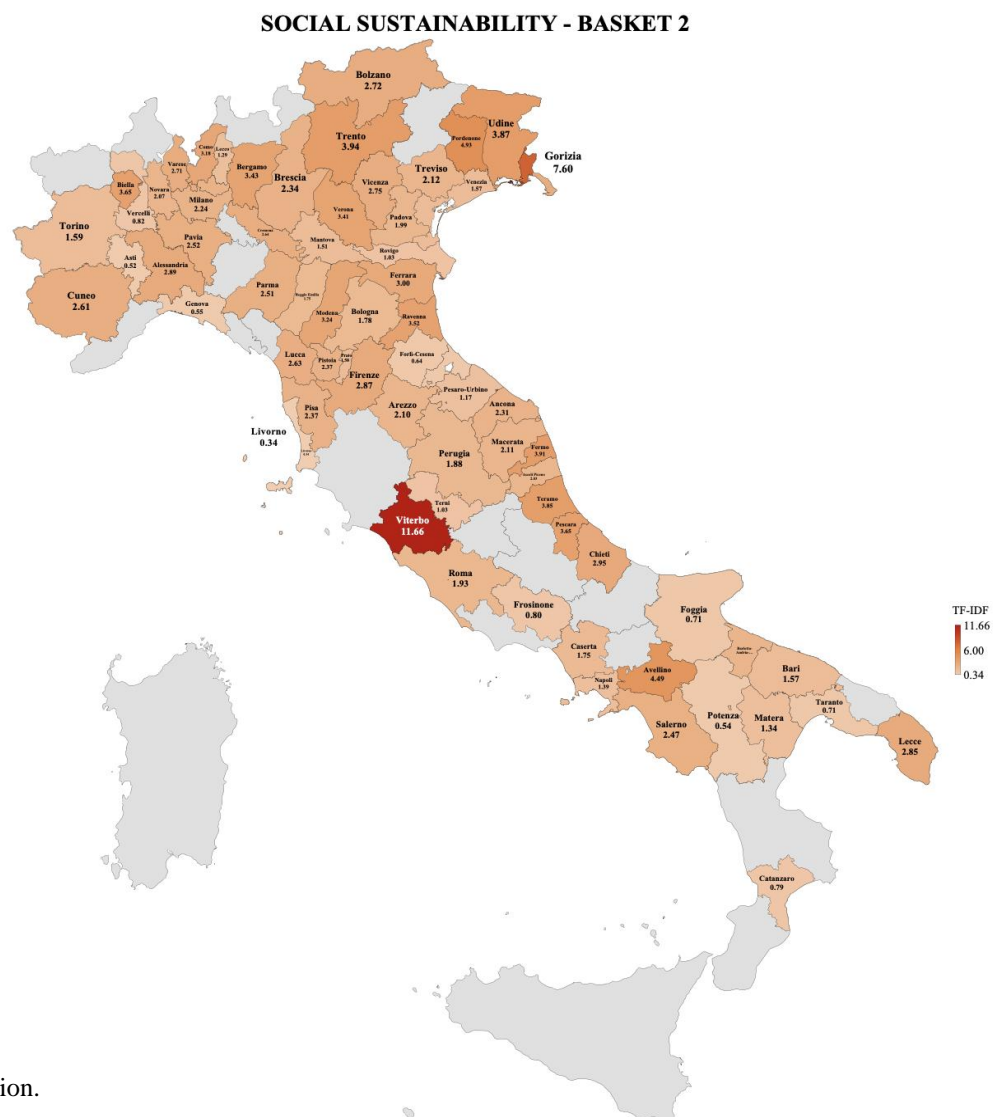
⁶ Source: UN Global Compact (no date) Social Sustainability. Available at: <https://www.unglobalcompact.org/what-is-gc/our-work/social>

actions undertaken by companies (also in line with considerations about the strong people component of industrial district areas). Moreover, many firms also mention having their own Code of Ethics setting forth the values, principles, standards, and best practices to follow when conducting business relationships.

An example is DiMar Group S.p.A.⁷, located in Viterbo and specialized in the production of leather goods: the company, which has been documenting its effort in social reports, has set sustainability requirements for its supply chain, created code of conduct in compliance with the international human rights standards, promoted inclusion, diversity and the development of the workforce and established beneficial relationships with the local community and authorities. Also, Miko s.r.l. has adhered to the protection and development of their workers by adopting health and safety standards and code of ethics underlining the principles of fairness, loyalty, integrity, and transparency.

Avellino, and in particular the leather tanning pole of Solofra (Tanning District of Solofra), is famous for the tanning of hides for the footwear, clothing and leather goods (Luongo and Viesti, 2015). Also, Fermo, province known for being part of the so-called “Show Valley”, is fuelled by the presence of tanneries and businesses dealing with different stages of the shoe-making process. Companies located in both these provinces show strong social commitment and solid ethical values that promote the enhancing of human resources and the establishing of stakeholder relationships based on transparency and trust.

Fig. 3: Average “Social Sustainability - Basket 2” TF-IDF scores for every Italian province



Source: our elaboration.

⁷ Source: DiMar Group - Sviluppriamo la forza dell'artigianato Made in Italy. Available at: <https://www.dimargroup.com>

5.2.3 Certifications (Basket 3)

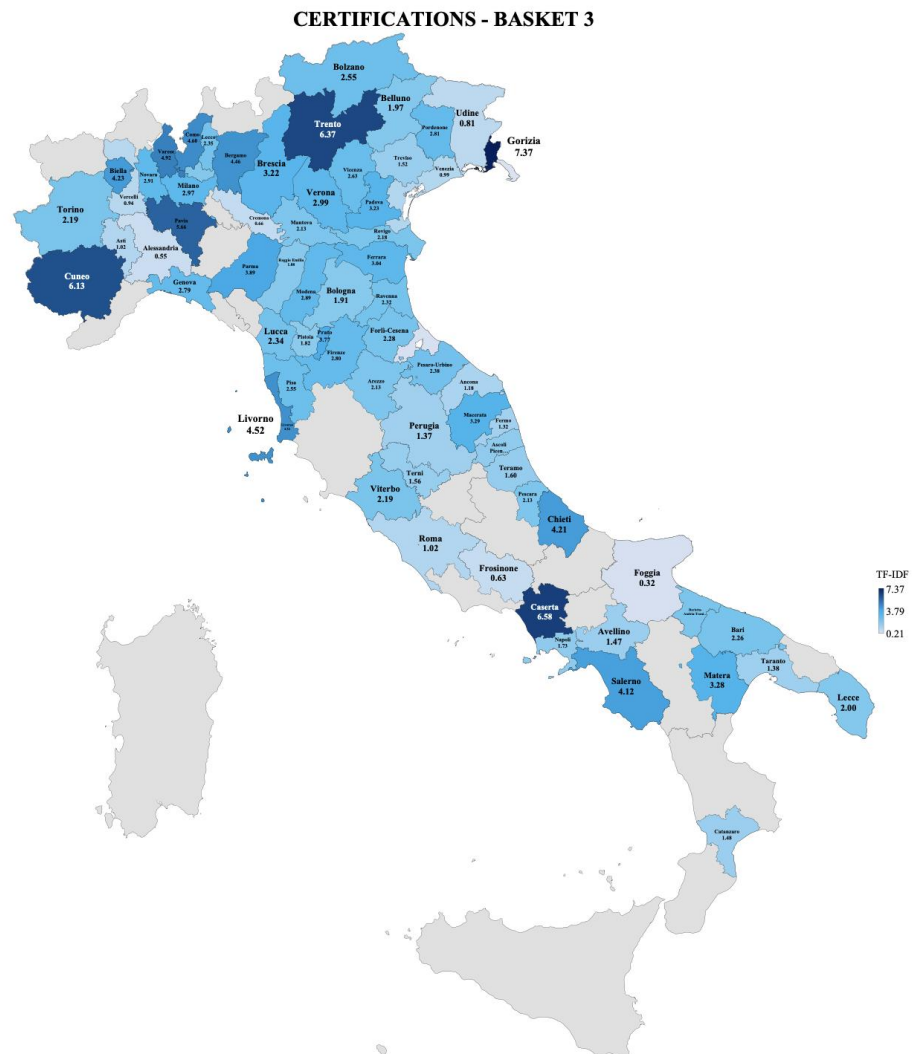
For this third subtopic, a wide range of certifications was considered: some of them focusing more on environmental aspects - such as green claims companies can make on their products (ISO 14021), the certified responsible origin of materials (FSC, or Forest Stewardship Council, and Oeko-Tex® Standards, for the textile and leather sectors), and about the recycled content of final products (RCS, or Recycled Claim Standards) - and others - like SA8000 and ISO 26000 - being more concerned with social responsibility issues. Many businesses, by complying with the quality standard ISO 9001, aim at guaranteeing their customers the absence of harmful or toxic substances in their products, in which Italy was found to be particularly advanced.

As it can be seen in Figure 4, Northern Italy is where the phenomenon of companies certifying their sustainability efforts has been found to be more present, even with some interesting exceptions detected in Southern Italy.

Gorizia (Friuli-Venezia Giulia), Caserta (Campania), Trento (Trentino-South Tyrol), Cuneo (Piedmont), Pavia (Lombardy), Varese (Lombardy) and Como (Lombardy) have the best 10% scores when it comes to certifications. Indeed, most of the companies based on these areas have dedicated extensive sections of their websites to illustrate them.

Most companies in the areas are textile manufacturing businesses (as in the case of Como and Pavia, located in areas where industrial districts are present) meaning that not only this segment is the one which discusses the most about sustainability, but it is also the one more proactive in proving and demonstrating their real, actual commitment.

Fig. 4: Average “Certifications - Basket 3” TF-IDF values for every Italian province



Source: our elaboration.

5.3 *The Most Sustainable Made in Italy Companies*

Cotonificio Olcese Ferrari S.p.A.⁹ (Brescia, Lombardy) not only holds the top spot in “Green Sustainability”, but it also the best performing company overall. Brescia, with its nearby alpine valley crossed by the river Serio, is where textile manufacturing businesses have historically been operating, giving life to the Textile and Clothing District of Val Seriana: indeed, the Cotonificio is a well-known manufacturer of high-quality yarn, founded in 2017 from the merger of two historical companies operating in the same sector. On the website, the Cotonificio Olcese Ferrari mentions many themes related to green sustainability; in particular, topics of circular economy, eco-design, waste recycling and environmentally friendly fibres are extensively illustrated. Moreover, the company has achieved good results for each subtopic, but it is also interesting to notice that the company talks much more about its certifications (mentioning Better Cotton Initiative, Oeko-Tex Standard 100, FSC and GRS certifications among others) than about its social commitment.

Kering Italia S.p.A.¹⁰ (Florence, Tuscany) ranks first regarding “Social Sustainability” and 54th overall. The luxury group has its registered office and manufactures in Scandicci (municipality in the province of Florence), part of the Leather goods and Footwear District of Florence. In its website, Kering has dedicated a specific section, “People in the supply chain”, about the group’s commitment to respect human rights, safeguard its heritage, and foster diversity and inclusion. Moreover, the group scores well also regarding the environmental point of view, with the company having created an innovative Environmental Profit & Loss for measuring and reporting the impact of the operations of the company and of the other players of the supply chain.

Tessiture Pietro Radici SpA¹¹ (Bergamo, Lombardy), occupying the 164th position in the overall ranking, is also at the top when it comes to the “Certifications” subtopic. Located in the Textile and Clothing District of Val Seriana, the company, part of the Radici Group, produces the non-woven fabric Dylar® while maintaining the highest standards of sustainability, certified by ISO 14001, ISO 45001, ISO 50001, ISO 9001, and Oeko-Tex standards.

Imprima Industrial Lonate S.r.l.¹² (Varese, Lombardy), the first company for “Sustainability” conversation, placed 213 in the overall ranking. Founded in 2016, the company, which combines different brands leader in printing and finishing of textile, aims at contributing to the achievement of Sustainability Development Goals thanks to a comprehensive strategy focused on water, energy, emission, and certification management.

5.4 *Discussion*

Previous research on Italian industrial districts, considered dynamic entities with different possible evolutionary patterns, has largely been focused on the future development of these agglomerations; for instance, the opportunities and challenges faced during the globalization process have attracted the attention of many academics, leading to significant scientific production on the topic (Sammarrà and Belussi, 2006).

However, with climate change and geopolitical issues becoming increasingly urgent, riskier, and impactful, the transition towards a more sustainable fashion industry has become more of a necessity than ever before. Hence, and regarding its main theoretical implications, the present study contributes to filling gaps regarding the current sustainability performance of Italian fashion businesses by adopting a methodology that allowed to compare how different Italian regions and provinces communicate their sustainability efforts online and highlight the pivotal role of traditional industrial districts in promoting the adoption of green and social practices.

⁹ Source: Cotonificio Olcese Ferrari | Produttori di Filati Italiani. Available at: <https://www.olceseferrari.it/it>

¹⁰ Source: Kering: gruppo francese di lusso. Available at: <https://www.kering.com/it/>

¹¹ Source: Tessiture Pietro Radici - Radici Group. Available at: <https://www.radicigroup.com/it/prodotti/fibres-and-nw/dylar/azienda>

¹² Source: IMPRIMA. Available at: <https://www.imprima.group>

Environmental sustainability conversation was found to be the most developed out of the four themes analysed, also proving previously made statements about social sustainability and certifications being more blurred and less defined than the green aspect.

Overall, sustainability conversation is more diffused in regions and provinces traditionally linked with fashion production: indeed, as it can be seen in Table 3, not only the number of companies located Lombardy, Piedmont, Veneto, Tuscany and Marche (where famous industrial districts have been operating for decades) is much larger than for other territories - such as Sicily or Calabria, where only one company for each region was detected - but these regions were also still able to obtain very high and satisfactory scores in each subtopic.

The higher number of businesses, and the fact that, when considering the best 200 TF-IDF scores overall, 90% of the companies are either based in Lombardy (more specifically, in Bergamo, Brescia, Como, Milan, Pavia and Varese), Piedmont (in Biella), Veneto (in Belluno, Padua, Treviso and Vicenza), Tuscany (in Arezzo, Florence, Livorno and Prato) and Marche (in Fermo and Macerata), suggest that companies located in industrial districts can positively influence each other when it comes to sustainability. Indeed, as affirmed by Mazzoni (2020), the networking nature and geographical proximity characterizing industrial clusters make them particularly suitable for the introduction of eco-innovations.

Regarding the type of companies, textile businesses, which manufacture inputs for the production processes of other businesses, for both fashion but also other industries, and often little known by the media and public, were the ones recording the highest results. As mentioned before, raw material production has been pointed out by both literature and other international institutions as the most polluting and unsustainable phase out of all the stages of fashion supply chain: however, this phase also allows for significant opportunities when it comes to the reduction of its negative impact, especially regarding the environment. So, it could be suggested that firms adopting these measures would want to communicate in their websites, feeling they could obtain a competitive edge over other firms selling similar products. In fact, the adoption of sustainable measures not only is beneficial for the environment but can have important benefits also on the company's performance, in terms of higher efficiency, cost savings and increased quality and safety for workers.

The fact that during the analysis it was found that even if bigger brands tend to be the ones maintaining official and complete websites, in some cases smaller companies were more proactive in disclosing relevant information than their larger counterparts (Arora *et al.*, 2016) is in line with considerations about these businesses taking advantage of online communication to generate interest and enlarge their customer base.

About practical and managerial implications, this analysis could inform both managers and policymakers about the sustainability performance of both larger and smaller companies. Focusing on managers, knowing their company obtained a low TF-IDF score could lead them to change the way in which their firm communicate sustainability efforts online, also prompting them to aim for sustainability certifications to testify their commitment.

By identifying areas with medium or lower sustainability orientation, policymakers, such as national and local authorities, could enact specific measures to support the widespread of best practices and increase awareness about the need, for companies, to incorporate sustainability in their future strategies, also with the aim of valorising local communities.

Lastly, even if rigorous approaches and methods were applied to minimise biases and subjectivity, limitations of this method need to be acknowledged. The drawbacks of adopting companies' websites as sources of information were underlined to be their non-standardization, them being self-reported and unstructured, other than frequently changing; for these reasons, the analysis performed here could be enriched with other data sources to further support and contextualize the findings.

Moreover, other limitations concern the criteria adopted to select the sample of companies, only Italian fashion businesses described by specific NACE codes, and the baskets of words, other than structural constraints of the software QIBA. For these reasons, further analyses are suggested, with

new research opportunities possibly arising from analysing the correlation between TF-IDF values and other variables, such as turnover, from investigating specific areas of interest highlighted during the analysis and from only considering the best scores of specific areas when computing average values.

On the other hand, further research could also investigate more in depth some regions, like Viterbo, and Sicily, which achieved good scores in one subtopic (with the social aspect being particularly discussed in the case of Viterbo, whereas it was environmental sustainability for Sicily) but also significantly lower scores (not even presenting one for Sicily) on certifications. Moreover, worth mentioning is also the case of those “sustainability champions”, such as Gorizia (Friuli-Venezia Giulia), the only province appearing in the highest spots for all the four subtopics - located in territories not traditionally linked to fashion production: investigating them could help shedding some light on the characteristics and drivers of such commitment, understanding if those are really just virtuous, isolated cases that, with the right support, could represent the starting point of an evolutionary process involving their surrounding areas, or if these companies are just indulging in greenwashing behaviours.

Lastly, following the work of Blasi *et al.* (2022), the cognitive proximity of these companies could be explored, possibly identifying the presence of networks of fashion companies particularly committed to sustainability.

6. Conclusions

The main search question of this study was investigating the current state of the relationship between fashion and sustainability, firstly by focusing on the scientific production on the topic for then providing empirical evidence on the efforts put in place by the fashion industry, with a particular focus on the Italian case.

Already in 2014, when the iconic fashion designer Vivienne Westwood pronounced her famous motto “Buy Less, Choose Well, Make it Last”, people were starting to understand the urgent need for a deeper connection between fashion and sustainability, in order to achieve a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987). This sustainable development entails introducing significant innovations and changes to achieve relevant improvements to both the environment, reducing the significant negative impact the industry has on the planet, and the society, guaranteeing to every worker employed in the industry not only the respect of the basic human rights, but also the opportunity to live in a dignified and satisfactory manner.

Scientific production on the relationship between fashion and sustainability is recent but still significant. In particular, the topics of consumers’ perspective on the dichotomy between fast and slow fashion, the management of sustainable supply chain management, the emerging of new businesses models and the role of luxury fashion in promoting the transition towards a new paradigm are crucial frames of analysis.

Then, since both fashion companies and policy-makers have increasingly been considering sustainability concerns into their strategies and future agendas (Geissdoerfer *et al.*, 2017), with businesses introducing new business models in line with sustainability principles and national and supranational authorities (such as the European Union) enacting policies to support the transition towards circular economy, exploring the current situation of the industry with respect to social and environmental sustainability allowed to grasp both the benefits deriving from fashion actors altering the way in which they has been operating in the last decades but also the many challenges and obstacles still to overcome.

What emerged is that supply chains could really play the role of “core activators” of sustainability commitments: for both literature and media, collaboration between stakeholders within and outside the value chain, the setting of standards, well-defined targets and code of

conducts for facilitating measuring and reporting, obtaining certifications and greater supply chain traceability and transparency could all be the keys to unlock a better future and improve the sustainability performance of the industry.

Indeed, to assess this aspect in relation to the Italian fashion industry, the web-based sustainability communication of companies was investigated by adopting the novel content analysis methodology based on the term frequency - inverse document frequency weighing scheme, ranking firms' s official websites according to their commitment to environmental, social, certifications, and sustainability themes.

The empirical findings of this study suggested a connection between sustainability performance and spatial distribution of companies, with awareness about sustainability topics being higher in areas traditionally associated with the industrial district model, proving the positive influence played by geographical proximity in promoting the sustainability orientation of companies located in these specific areas.

On the topic of Italian industrial districts, illustrating this reality was deemed necessary, as the development of *Made in Italy* fashion has been largely due to the success, leadership and reputation industrial districts were able to achieve nationally and globally. Some of the best results were obtained by firms dealing with different phases of the textile production process located in historical district areas, suggesting the idea that sustainability communication, for them, represent a way to differentiate themselves from the myriad of surrounding companies, profiling a new competitive advantage based on the higher quality, efficiency and durability products made with more sustainable process and materials can guarantee. However, what also emerged is that the Italian fashion industry still needs to strengthen its environmental and social commitment, also supporting previous remarks about the sector lagging other industries and about social sustainability conversation and certifications being largely underdeveloped (despite recent indications about its increasing relevance among both companies and customers, especially the younger generations).

In conclusion, the fashion industry will truly embrace sustainability only when collaboration between different actors of the supply chain, institutions, governments, and consumers will be achieved. Customers can surely change their mindset about sustainable fashion and close that famous attitude-behaviour gap, but companies, also supported by their value chains and the various international and national entities, will have to firstly embrace sustainability, it being environmental or social, at a higher level than they have ever done before. A true collective effort towards a greener, fairer but still fashionable future for the people and the planet.

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How sustainable is smart farming? The contribution of service platforms to innovate Italian agribusinesses[♦]

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Abstract

Framing of the research. *Given social and environmental challenges, agrifood industry needs to embrace digitalization strategically innovating for ecological transition and sustainable growth. A conceptual framework, empirically informed, is proposed, by adopting a mixed method approach in Italian wineries' context.*

Purpose of the paper. *This paper aims to analyse how the sustainability of winery organizations could improve by implementing agricultural precision systems in place of conventional ones thanks to a digital service platform.*

Methodology. *A mixed methods approach based on both quantitative and qualitative analyses is conducted, to better deepen how a solution provider sustain the socio-technical transformational processes for the emergence of a smart farming sustainability-oriented ecosystem.*

Results. *The results contribute to the literature by enriching a conceptual framework, empirically informed. It describes dimensions and relationships, which enable the actors involved in reaching higher sustainability outcomes.*

Research limitations. *The low sample investigated, and the low number of interviews do not allow a consistent generalization of the results.*

Managerial implications. *Evidence from the case studies can inform both practitioners and policy makers about best practices and process innovation activities which can increase the shared value creation in the agrifood ecosystem.*

Originality of the paper. *This is one of the first studies to take in consideration a relevant topic, still poorly investigated, by deepening how a service provider supports the wineries' digital servitization towards sustainable outcomes.*

Key words: *digital servitization; service platform; precision agriculture systems; winery organizations; sustainable ecosystem; smart farming*

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1. Introduction

The increasing number of environmental and social challenges worldwide evolving (e.g., climate change, energy demand, nutrition, etc.), also speeded by the recent post COVID-19 pandemic effects, restored the debate about the need for a more sustainable way of doing business (Isaksson, 2021). Starting from the dissemination of the report published by the UN World Commission on Environment and Development (Brundtland, 1987), which provided an accepted definition of the sustainability three main pillars: economic, social, and environmental sustainability, the topic of sustainability and the sustainable development is today a top priority on the globally political and academic research. This is evident through the continued launch of new blueprints (e.g., millennium development goals to sustainable development goals) by intergovernmental organizations (e.g., United Nations) to address the world's growing problems. At the same time, in contemporary research there is a growing attention in exploring innovative solutions; particularly, there is the need to explore how organizations can reorient their strategies and readapt their processes to contribute to the achievement of sustainability at corporate, societal, and environmental levels.

Among the various sector, the agri-food one is more vulnerable to global climate change and is expected to face several challenges based on some potentially risky global trends (De Clercq *et al.*, 2018). The growing number of people, estimated to reach approximately ten billion by 2050, corresponds to greater demand and, in turn, increased food production.

The use of natural resources, including farmlands and water, is highly unsustainable. The practices of deforestation, inadequate fallow periods, overuse of water resources, vegetation overcutting and fast urbanization, among others, reduce the efficiency and effectiveness of agricultural management (Dong *et al.*, 2018). In addition, inefficient farm machinery practices waste large amounts of energy resources (Fountas *et al.*, 2015). According to the Intergovernmental Panel on Climate Change (IPCC), agriculture is one of the main sources of greenhouse gases (GHGs), contributing to the largest share of global methane and nitrous oxide emissions (IPCC, 2022). In turns, the various side effects of climate change, such as the occurrences of droughts, floods, extreme weather conditions, groundwater depletion and soil degradation negatively affect agriculture and food production systems. In addition to these elements, the growing percentage of food waste represents a massive market inefficiency as well as another environmental and societal issue.

The European Green Deal supports the key role of digitalization for ecological transition and sustainable growth. For this reason, the EU Commission pushes member states to invest in new digital technologies developed for agriculture activities, aiming at increasing the sustainability and competitiveness of the sector, while enhancing the conditions of farmers by simplifying their daily work (Savastano *et al.*, 2022). These changes are essential to achieve the objectives set by the new common agricultural policy (CAP) 2023-2027, which floors the way for fairer, greener and more performance-based agriculture in line with the objectives of the European Green Deal¹. At the core of the new CAP, the “Farm to Fork” strategy aims to improve all stages of food production, avoiding waste, promoting a conscious and sustainable consumption as well as efficient processes of production and distribution². Particularly, the purpose of this strategy is to mitigate the environmental impact of the agri-food chain, preserve biodiversity, ensure access to safe, healthy, and sustainable food, thereby generating a fair agrifood economy.

Furthermore, the EU arises different goals to be achieved by 2030, such as the 50% reduction of pesticides and plant protection, the reduction of fertilizers and, consequently, of climate-altering emissions, and the promotion of organic agriculture. Indeed, one of the main goals in this field is to reach at least 25% of lands cultivated organically (Silva *et al.*, 2022).

Digital transformation can be an important driver of sustainability; indeed, following the Industry 4.0 paradigm, European agriculture is experiencing a digital revolution. Technological innovations such as Internet of things (IoT), artificial intelligence (AI), smart autonomous robotics,

¹ https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/new-cap-2023-27_en

² <https://www.consilium.europa.eu/it/policies/from-farm-to-fork/>

Decision Support Systems (DSS) and blockchain applications enable the possibility to collect and analyze large amounts of data which support businesses actors to take better-informed decisions for optimizing processes and products (Hrustek, 2020). Likewise, Industry 4.0, precision agriculture systems, also known as smart farming or agriculture 4.0, integrates digital technologies into business processes to raise productivity levels and to develop new digital ecosystems (Trivelli *et al.*, 2019). The collected data through in-field sensors, drones and satellites allow farmers to monitor crops and livestock. These systems help in improving crop yields, reduce costs, including labour costs, and optimise process inputs (Tantalaki *et al.*, 2019). At the same time, this can lead to increase profitability, work safety, and reduce the environmental impacts of farming management, thus contributing to the sustainability of agricultural production (Barnes *et al.*, 2019).

However, although with some important investment and finance options (e.g., the European Structural and Investment -ESI - Funds to support small and medium enterprises (SMEs) to foster a smooth green and digital transition), this sector still lacks human, territorial, and knowledge resources for the successful digital transformation. Indeed, introducing disruptive innovations in such a traditional sector may lead to an upheaval of a prior organization, especially in small farming businesses, requiring digital skills and related capabilities, and new business models (Sarri *et al.*, 2020). Moreover, the academic literature on this topic is still scarce (Moretti *et al.*, 2023).

Recent studies indicate that digital technologies not deliver as much value in practice as providers promise and need reformulation from the user's perspective (Silvi *et al.*, 2021). Digital Servitization (DS) arises as both a theoretical lens and a possible solution able to valorise users' needs, by affording both technological and social facets. In the literature, DS has been defined as digital-enabled services relying on technological components embedded in physical products (PSSs) that enable new ways of value creation by combining tangible and intangible elements (Ciasullo *et al.*, 2021; Schiavone *et al.*, 2022). Particularly, knowledge acquisition and inter-firm collaborations assumes a key role in shaping new modalities of innovation in pursuing sustainability. Then, DS allows to enhance socio-technical systems. As previously stated, a lack of digital readiness in acquiring technical knowledge limits farming actors in exploiting the strategic potential of digitalization for achieving sustainable goals. Therefore, this paper assumes that a digital service platform could support farming businesses' both in acquiring new knowledge from data and in activating and nurturing collaborations with networked actors able to frame a digital sustainability-oriented ecosystem.

Accordingly, the leading research question arises as follows:

RQ: How do digital service platforms allow farming businesses to achieve sustainability gains?

Given the research design characterised by a mixed methods approach based on sequential quantitative and qualitative data analyses (Tashakkori and Creswell, 2007), two sub-questions have been developed to clearly include interconnected socio-technical components of the study:

RQ1.1: What are the effects of precision agricultural systems on farming businesses' operations management?

RQ1.2: How does the interaction between digital service platforms and farming businesses contribute to achieve sustainable outcomes?

Empirically, the study focuses on the Italian wine sector, given its relevance in terms of sales and product quality (Stanco *et al.*, 2020; D'Amato *et al.*, 2022), as well as the recent investments in innovation, for smarter and greener production processes, along with renewed organizational and managerial models (Muscio *et al.*, 2017; Nazzaro *et al.*, 2022).

The paper is structured as follows: in Section 2 the theoretical background is analysed, and a framework is proposed. Section 3 illustrates the research methodology. Sections 4 and 5 provide, the results and the discussion, highlighting the contributions of the study. Section 6 proposes concluding remarks, limitations and future research.

2. Literature Review

2.1 Digital transition for sustainability in the agri-food sector

The digital transition of agri-food sector depend on Agriculture paradigms shifts throughout the decades (Dayioğlua *et al.*, 2021; Zhai *et al.*, 2020). Indeed, if Agriculture 1.0 referred to the conventional agricultural age, focusing primarily on human and animal forces, where basic instruments were utilized in agricultural activities; Agriculture 2.0 developed when industrialization arose. In this scenario, agricultural machineries were operated by farmers and plenty of chemicals were used: productivity and efficiency significantly increased. However, this considerable advancement has provoked unfavorable side effects over the years, such as: field chemical pollution, ecological environment degradation, excessive power use, resource loss, affecting an overall loss of diversity, both biological and cultural. The Green Revolution in 20th century has brought to a new era named Agriculture 3.0, which allowed both to automatize processes, and to reduce the use of chemicals, thereby involving production change in the agricultural manufacturing systems. Then, the continuous development of cutting-edge technologies and related applications coming from the Industry 4.0, such as cyber-physical systems (CPS), the Internet of things (IoT), cloud computing, Big Data analytics, Artificial Intelligence (AI), have tracked the path for a new agri-tech paradigm: Agriculture 4.0 also known as smart agriculture. Particularly, Agriculture 4.0 represents the latest evolution in precision agriculture and involve the use of the mentioned technological innovations of Industry 4.0, combined with sensors, robots, and AI, especially machine learning (ML) techniques, for advanced data analysis (Sott *et al.*, 2020).

The need to digitalize agricultural activities and related processes seems to be essential to improve the quality and sustainability of crops (Shepherd *et al.*, 2020), to ensure a better food production using few natural resources (Lezoche *et al.*, 2020), to reduce food loss and waste, and to enhance food safety by enabling product identification, tracking, and tracing throughout the overall supply chain (Akyazi *et al.*, 2020). Indeed, many of the expected advantages of digitalisation focus on higher efficiency via precision mechanization, automation, and better decision making (Fielke *et al.*, 2020), as well as higher food traceability through real time data collection and sharing.

As a result, digital transformation is playing a central role in shaping the future of the agri-food sector, embracing the challenges towards environmental, social, and economic sustainability (Abbate *et al.*, 2023; Zhai *et al.*, 2020).

Precision agricultural systems have seen increasing interest from both agribusinesses and the research community over the past decade. European policies have certainly guided these choices, especially the Farm to Fork strategy as one of the key actions of the European Green Deal (see section 1). This push is also promoted by the Sustainable Development Goals (SDGs) endorsed by UN as part of the 2030 Agenda for Sustainable Development, which cover environmental and economical sustainability themes, as well as social issues like hanger, poverty and job opportunities in rural areas or knowledge transferring toward new generations. Among the 17 goals, precision agriculture systems can positively impact on SDG 2 related to food, SDG 6 (water), SDG 7 (energy), SDG 13 (climate change), and SDG 15 (ecosystems) (Dayioğlu and Turker, 2021; Latino *et al.*, 2021). For instance, big data analytics to detect infections for the prevention of pathogen attacks in the vineyard is spreading fast and scholars devote attention to these solutions (Maddalena *et al.*, 2023). IoT enables the development of innovative pathogen monitoring systems in the field (Spachos, 2020). A longitudinal study taking as reference a 9-year base of climatic data, was conducted in 153 Bordeaux's vineyards, where machine learning algorithms were compared to identify the most efficient one (Chen *et al.*, 2020a).

Nevertheless, digital technologies *per se* does not allow the consequent accomplishment of sustainability goals at corporate level. Indeed, assuming a socio-technical perspective, the literature stresses the need for organizations to start a profound transformation, through radical changes about business models, organizational layouts, and related processes (Teece and Linden, 2017). Going over, several scholars have outlined the difficulties to embrace digital technologies and related

tools, particularly linked to the farmers' resistance to technology, data analysis, data management, as well as the need to develop new digital skills and related capabilities (Smania *et al.*, 2022). All in all, research has particularly focused on the benefits of digitalization, by neglecting the mechanisms through which agri-food companies can exploit the strategic potential of digitalization for achieving sustainable goals.

2.2 Innovation for sustainable value creation: the role of Digital Servitization

Business customer expectations shifted from buying products to adopting sophisticated solutions that enable not only the searching for new economic opportunities, but also tracking new ways to reduce the environmental and societal impact. This means that, instead of paying for the product or technology itself, users increasingly want to receive the value inherently offered by its use, consuming it as a service. Servitization, which describes the shift from a product centric to a service centric logic (Kowalkowski *et al.*, 2017), entails a transformation journey deeply embedded in the company's value-generating mechanisms and acts as a manifestation of the firm's business strategy (Gebauer *et al.*, 2021).

Digital servitization (DS) is based on the interplay between digitalization and servitization (Kohtamäki *et al.*, 2020; Paschou *et al.*, 2020). To approach DS, firms require both digitization and digitalization: the first one refers to the conversion of analog information into a digital format (Ng and Wakenshaw, 2017); the second one refers to the combination and recombination of digital technologies to create and harvest value in new ways, by automating processes through new technological applications, unlocking the potential of digital technologies such as AI and DSS to collect data, identify patterns and make smarter business decisions (Rupeika-Apoga *et al.*, 2022; Svahn *et al.*, 2017). Managerial research has focused on digital servitization, referring to a change in service offerings that become digital (Allmendinger and Lombreglia, 2005), by reconfiguring business models (Paschou *et al.*, 2020) towards a service orientation (Adrodegari and Saccani, 2017; Ciasullo *et al.*, 2021). Furthermore, Sjödin *et al.* (2020) described DS as "the transformation in processes, capabilities, and offerings in industrial firms and their associate ecosystems to progressively create, deliver and capture increased service value arising from a broader range of enabling digital technologies". Thus, digital servitization can impact both on internal and external processes of firms. Coreynen *et al.* (2017) argue that digital servitization can be observed through two perspectives: back-end and front-end. The back-end perspective looks at firms' internal processes, where digital servitization allows firms to boost the ability to create new solutions (Storbacka, 2011), to enhance operational performance (Klingenberg *et al.*, 2021), to increase transparency for improving decision-making (Ness *et al.*, 2015). The front-end perspective focuses on firms' external processes, where digital servitization permits firms to shape new types of customer interaction and closer integration with network actors (Perks *et al.*, 2017; Sklyar *et al.*, 2019). Despite back-end and front-end perspectives are clear, the literature stresses the complexity that arises to handle digital servitization all along the value chain (Tóth *et al.*, 2022), regarding the coordination among intra and inter activities towards an attitude able to face the change or to renew the value proposition (Baines and Lightfoot, 2014). In this scenario, digital platforms emerge as focal drivers for addressing digital servitization as a capability, by reconfiguring sustainable-oriented network ecosystems from the point of view of relational and structural features (Ciasullo *et al.*, 2021; Schiavone *et al.*, 2022). Such a systemic approach emphasizes the need for a progressive and comprehensive transformation of the company's ecosystems, including suppliers, partners, and customers. The strategic objective is a configuration in which the value is co-created through the optimization of resource usage, the effective operation and leveraging of digital technologies (Parida *et al.*, 2019). Typically, this shift can be described by the change from product platforms to platform ecosystems based on network interactions, which represent the backbone of successful servitization strategies in sectors characterized by digital transformation (Cenamor *et al.*, 2017). A digital platform, through modularity, can reconfigure and reuse certain assets (Andersen *et al.*, 2022; Krishnan and Gupta, 2001), by exploiting economies of scale and scope for reshaping the

design of product, the manufacturing process, or the distribution channel. Indeed, modularity allows a flexible configuration of several offerings using different combinations of modules for servitized products (Bask *et al.*, 2010) and an improvement in the communication regarding the value proposition (Böttcher and Klingner, 2011). Moreover, digital platforms can intervene as a booster of interactions and sharing of knowledge in the network ecosystem (Cenamor *et al.*, 2017). Then, a digital platform may track the path for a reconfiguration of firms for better implementing digital servitization. Consequently, it appears central the orchestration role of a digital platform for empowering network ecosystems towards sustainable trajectories (Chen *et al.*, 2020b; Schiavone *et al.*, 2022). The digital transformation brought by those platforms and the relevant digital ecosystems is thus shaped by the interaction between technologies and the people who use these technologies, as well as by innovation policies (Brunetti *et al.*, 2020).

Digital servitization is a very challenging transformational journey especially for SMEs, which often require the support of external partners to integrate their capabilities and tackle with such complex innovations and knowledge. Studying the digitalization of agricultural systems, Fielke *et al.* (2020) found that the transparency of practices and informational interaction between farmers, advisors, agri-businesses, consumers, and regulators is driven by growing connectivity. When DS is successfully implemented, firms can expand their offerings through higher differentiation from rivals, increase revenues and profits, become more resilient to changes and crisis (Rapaccini *et al.*, 2022). In broader terms, considering also environmental and social aspects, DS was also found to lead companies from the manufacturing sector to increase their sustainability (Paiola *et al.*, 2021). In this context, Paschou *et al.* (2020) in their recent systematic literature review report several benefits of DS for society and the environment: reduction in energy consumption, decrease in environmental impact, a positive effect on social sustainability, value delivery for the entire society, and the implementation of sustainable production processes. However, despite this interplay was found to be based both on knowledge and technological infrastructures, the aspects of these relationships are still understudied (Kowalkowski *et al.*, 2017; Gebauer *et al.*, 2021), especially in terms of sustainability gains (Paiola *et al.*, 2021) and with reference to agricultural innovation systems. Particularly, in the agrifood sector the main focus of past papers was on original equipment manufacturers (OEMs) driven towards digital servitization by the spread of precision agriculture (Agriculture 4.0) and the change in agribusinesses needs connected to several aspects: (i) increase productivity to compete with countries where costs are lower and legislation is less restrictive; (ii) to continually invest in facilities to remain efficient; (iii) to observe new environmental standards and (iv) to reduce the typical risks and uncertainties of agricultural activity (Smania *et al.*, 2022).

2.3 Theoretical speculations

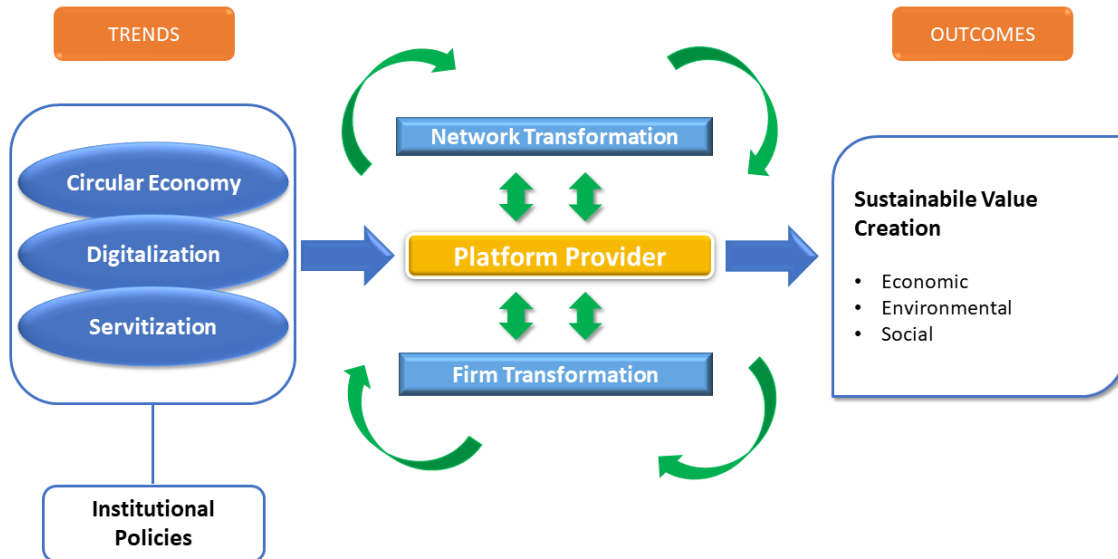
The analysis conducted so far has highlighted some important evidence on the phenomenon under study, revealing antecedent and consequences of the transformation brought by the development of innovative product-service systems (PSSs) based on digital servitization enabled by platform provider (Frank *et al.*, 2019).

Particularly, starting from the trends currently characterizing the agrifood sector, such as the digital transformation, servitization, and the circular economy pushed by sustainability policies both at global and local level (e.g., UN SDGs, EU Green Deal, New PAC, etc.), the literature emphasized the key role of partnership based on the exchange of technological innovation and knowledge as a service to support the digital transition of agribusinesses, especially SMEs (Paiola *et al.*, 2021). This helps overcoming the lack of resources and competences, to reach positive outcomes in terms of economic, environmental, and societal sustainability enabled by digital innovation (Smania *et al.*, 2022).

However, this process was found to be twofold, necessarily involving two levels of analysis (Paiola *et al.*, 2021; Parida and Wincent, 2019): (1) the transformation at a network level, where these trends were found to boost the interplay among partners and ecosystem orchestration; (2) at

firm level, where the transformation builds on the need for updating corporate resources and capabilities through the new knowledge acquired. Based on these relationships, we have designed our conceptual framework, as shown in Figure 1, which guided the empirical phase of the study.

Fig. 1: Conceptual framework of the study



Source: our elaboration

3. Methodology

3.1 Study strategy and design

To understand how a solution provider sustain the process of reaching sustainability gains in agrifood ecosystem, the authors adopted a mixed methods approach based on both quantitative and qualitative analyses (Tashakkori and Creswell, 2007).

Firstly, a quantitative analysis was performed as an in-depth cost-benefit analysis. To answer the RQ1.1, as a first phase, a bibliographic analysis was carried out to identify the main operations management metrics (e.g., costs, revenues and profits connected to the phases of wine-grape growth, harvesting and wine making) considered by wineries. The aim of this phase was to find out what are the potential improvements in terms of sustainability performance due to the adoption of innovative practices enabled by a digital PSS. To do so, a comparison was performed between two types of agribusinesses: conventional firm (i.e., not supported by the services of the platform provider), and 4.0 firm (i.e., precision agriculture systems are implemented).

Secondly, to answer RQ1.2, a multiple case study was performed. The explorative multiple case study is useful to capture and describe contemporary and practice-based phenomena within their natural setting, especially when the boundaries between them are blurred (Gummesson, 2017) and to conduct the analysis of respondent's attitude, experiences and behavior that cannot be easily obtained through other methodologies. Moreover, multiple case studies, instead of the single ones, allow researchers to deepen the phenomenon under investigation, by shedding light on any differences and similarities between the cases considered (Baxter and Jack, 2008). In any case, the main advantage of a multiple case study is to guarantee the reliability of the research, the replication of the analysis and the comparability of the results (Baxter and Jack, 2008; Yin, 2017). In this study, both the service provider and winery organizations are included as cases under analysis, to investigate on the one hand, the service platform as the focal actor, offering smart solutions and,

and on the other hand, how wineries accomplish this transformation process both at a firm level and a network level.

3.2. Data collection and data analysis

3.2.1 Quantitative analysis

A comparison between “conventional” and “4.0” agribusinesses was performed, also pointing out the type of farming and production (e. g., organic or not). The analysed sample was divided into different size classes: up to 2 hectares, from 2 to 20 hectares, from 20 to 100 hectares; and the classic structure of a company income statement was considered.

Data collection was based on secondary data, by considering both bibliographic studies and the focal actor’s documentation. More in detail, different studies served as the basis to make the comparison: Maddalena *et al.* 2023 for the number of treatments; Caffi *et al.* (2012) and Maddalena *et al.* (2023) for costs; Donna *et al.* (2011) for fertilization, where the reduction in the use of fertilizers was calculated thanks to the support of satellite analysis and the use of VRT (variable rate technology) for optimizing fertilization.

The measures concerning the “conventional” farm were defined by following the study by Condifesa (2023), in which agrifood investment costs are collected from Condifesas’s 10,000 members. Related findings show that the average quantity produced by the conventional vineyard, and the wine yield from grapes was set at 65% accordingly.

The costs for the vinification and bottling phases were extracted from the study by Ismea (2020) and represent 35% of the total costs; moreover, average prices for non-organic and organic wines were also derived from this study.

Finally, the cost of pesticide treatments and the cost of fertilization were calculated and compared in both conventional and 4.0 farms for assessing the main benefits of using smart farming systems.

3.2.2 Qualitative follow-up

As a second phase of the study, we collected both primary and secondary data following a data triangulation strategy. Secondary data were collected mostly from corporate websites and internal documentation. Primary data were gathered from 10 in-depth interviews both with founders of the service platform and owners of wineries operating in different Italian regions, which adopted services provided by the first one.

In line with the aim of the research, the unit of analysis of this paper is represented by the interplay between the service platform and the wineries, to understand how the focal actor could contribute to the complex transformation of wineries and their network towards sustainability gains. Data collection lasted 3 months between September 2022 and January 2023.

The authors interviewed service provider co-founders’ (i.e., CEO and CMO) and winery owners.

A semi-structured questionnaires was performed aimed at analysing which were the services provided by the focal actor, how these services were implemented by wineries and which processes have been renovated, thereby affecting the overall ecosystem. The interviews were audio-recorded and transcribed. Once collected data, they were analysed through a content analysis, in which the authors individually examined and evaluated the interview transcripts in respect to the paper's aims after sharing the research materials, methodology, and interpretive logics beforehand (Eisenhardt, 1989). This has allowed also to triangulate data (Flick, 2018).

3.3. Empirical context

Elaisian is one of the first agri-tech Italian venture; it was founded in 2016 with the aim to promote innovation in the agri-food sector. Its mission is “Revolution” intended as a priority in

supporting the transition and the renewal of local areas toward progress, competitiveness, and knowledge through innovations and new technologies. By considering business customers' needs, it provides tailor-made services and solutions, particularly precision agriculture systems. The innovative business idea has gained several awards such as the best 100 Italian start up in 2020, the best 500 FoodTech startups worldwide in 2021. The company is presents in 16 worldwide countries and more than 2,000 farming organizations are served.

4. Findings

4.1 Quantitative analysis

To assess the sustainability gains, findings of the comparative analysis, focus on the reductions in (i) number of pesticide treatments and (ii) the costs for fertilization and pesticide treatments.

Particularly, concerning pesticide treatments, based on the study by Maddalena *et al.* (2023) and Caffi *et al.* (2012), an average reduction of 59.5 % was calculated in terms of number of treatments and associated farm emissions and costs.

Concerning fertilization, based on the study by Donna *et al.* (2011) a 30% reduction in the use of fertilizers was calculated.

Then, the comparison between farming practices and outputs of a winery without and with the support of 4.0 services was calculated. Particularly, for pesticide treatments we have estimated savings ranging from € 598 to € 59,800 (table 1) and for fertilization from € 198 to € 19,800 (table 2), respectively for farms of 1 ha and 100 ha. Differences in costs and profits correspond to a reduction of 46% of pesticides treatments and 30% of fertilization, thanks to, respectively, on-field smart sensors and big data analytics through algorithms dedicated to the detection of infections for the prevention of pathogen attacks, as well as the analysis of satellite images, which precisely indicate only where fertilization is needed, thus increasing efficiency, and reducing unnecessary impacts and soil pollution.

Tab. 1: Pesticides - Convenience in using Agriculture 4.0

Farm dimension	1 ha	2 ha	20 ha	100 ha
Pesticides without 4.0 services				
No. of treatments	10	20	200	1000
Pesticides (€)	780	1.560	15.600	78.000
Transport and distribution (€)	520	140	10.400	52.000
TOTAL COST (€)	1.300	2.600	26.000	130.000
Pesticides with 4.0 services				
No. of treatments	5	11	108	540
Pesticides (€)	421,2	842,4	8.424	42.120
Transport and distribution (€)	280,8	561,6	5.616	28.080
TOTAL COST (€)	702	1.404	14.040	70.200
COST SAVINGS (€)	598	1.196	11.960	59.800

Source: our elaboration

Tab. 2: Fertilisers - Convenience in using Agriculture 4.0

Farm dimension	1 ha	2 ha	20 ha	100 ha
Fertilisers cost without 4.0 services				
Fertilisers (€)	500	1.000	10.000	50.000
Fertilisation (€)	160	320	3.200	16.000
TOTAL COST (€)	660	1.320	13.200	66.000
Fertilisers cost with 4.0 services				
Fertilisers (€)	350	700	7.000	35.000
Fertilisation (€)	112	224	2.240	11.200
TOTAL COST (€)	462	924	9.240	46.200
COST SAVINGS (€)	198	396	3.960	19.800

Source: our elaboration

Additional results were obtained by comparing conventional (non-organic) and organic winemakers. As shown in table 3, a quantitative reduction in terms of pesticides treatments and fertilization was observed by applying agriculture 4.0, respectively of 46% and 30% compared to conventional farming. Consequently, the total cost savings range from 4% to 9% for farms of 1 ha and 100 ha respectively; this leads to cost savings ranging from € 455 for farms of 1 ha to € 110,831 for farms of 100 ha. Thus, comparing total cost savings with farm profits using precision farming systems results in an increase in profits ranging from €3.600 to €428.000 for conventional farms and from €5.700 to approximately € 640.000 for organic farms, for farms of 1 ha and 100 ha respectively.

Tab. 3: Improved sustainability by using Agriculture 4.0

	1 Ha	2 ha	20 ha	100 ha
INTERVENTIONS REDUCTION				
PESTICIDE REDUCTION	-46%	-46%	-46%	-46%
FERTILISERS REDUCTION	-30%	-30%	-30%	-30%
TOTAL COST SAVINGS				
COST SAVINGS (€)	455,00 €	1.679,00 €	20.320,00 €	110.831,00 €
COST SAVINGS (%)	4%	7%	9%	9%
NON-ORGANIC PROFITS				
HIGHER PROFITS (€)	3.629,00 €	8.027,00 €	83.800,00 €	428.231,00 €
HIGHER PROFITS (%)	34%	37%	39%	40%
ORGANIC PROFITS				
HIGHER PROFITS (€)	5.745,00 €	12.259,00 €	126.120,00 €	639.831,00 €
HIGHER PROFITS (%)	22%	24%	25%	25%

Source: our elaboration

Two comprehensive tables (5 and 6) with all the values concerning the comparative analysis are provided in the appendix. The main additional operations useful in wine cultivation and production are also described and summarised as “other operations”. They are grouped together to simplify the reading and include weeding (€210), plant replacement (€500), pruning (€2,070), uprooting plants (diseased and old) (500 €), shredding (640 €), other work (checking structures and anchorages) (150 €), harvesting (860 €), insurance (700 €), for a total of 5,360 €.

4.2 Qualitative Phase

4.2.1 Case companies’ description

All the wineries are SMEs and four of them are organized in cooperatives. Table 4 shows the case companies’ profile. Both the cultivation of crops and the entire production process of wine is performed: from grape growing to wine production, to bottling, and selling. All the case companies have their own labels. Close collaborations with Elaisian are established. Winery owners listed several reasons why they established partnering with the focal actor: “*We need to digitalize our activities to preserve the biodiversity of our terroir*”; “*We need to better manage the riskiest danger for a winery business: vine’s infections*”; “*We aim to increase farm sustainability*”.

Tab. 4: Case companies’ profile

	Company 1	Company 2	Company 3	Company 4	Company 5	Company 6
Location	Puglia	Campania	Campania	Tuscany	Abruzzo	Piedmont
Vineyards extension	40 ha	175 ha	100 ha	14 ha	22 ha	1 ha
Farming management	Organic	Conventional/ Biodinamic	Organic	Organic	Organic	Organic
Number of employees	10	35	3	20	5	3
Annual turnover range (€)	600.000	4Mln	35.000	1 Mln	130-140.000	15.000

Source: our elaboration

4.2.2 Digital Servitization: firms' and networking' effects

A cyber-physical system and related solutions, such as a cloud-based big data analytics tool are implemented in different fields. Particularly, climate sensors, drones, global positioning systems (GPS), Internet of Things (IoT), cloud computing, and machine learning algorithms characterize the service platform. Its modular nature allows high customization and operational adaptiveness in promoting monitoring and predictive maintenance to crop management. In fact, climate sensors allow to control outside temperature, humidity, solar radiation, wind speed, so that winemakers can regulate the irrigation of fields according to weather conditions. For instance, they can decide to start an irrigation automatically in very cold temperatures, avoiding frost; or they can reduce the use of water, when sensors perceive high humidity, that already contributes to fields wet. Drones can detect dry areas and address problems that traditional watering equipment may have missed.

Furthermore, they can stitch thermographic photos together over time to detect the direction of water flow and locate geographical features that may affect water dispersion, thereby preventing an ineffective and unsustainable use of water. GPS enables the coupling of real-time geospatial data, spreading accurate position information about water dispersion and dry fields. IoT are used for the remote image capturing and processing for the detection of insects and vine diseases, and for pesticides, herbicides, and fertilizers tracking, allowing a continuous and constant control and improvement of their use. IoT are composed of interconnected sensors, which collect data that are aggregated through cloud computing.

These digital solutions allow to collect real-time data throughout all winery processes, which, thanks to machine learning algorithms systems are analyzed and shared through alerts in mobile apps, as valuable information. Indeed, an higher awareness about the concrete possibility both to face sudden ecological and social issues and to improve the effectiveness of crop management affect the winemakers. As one of the winemakers illustrated: *“Now we can map the field. For example, if you are going to fertilize a certain area or correct the soil, you can collect data in various area where you are going to plant: soil pH, what is needed to treat the soil, and what fertilizer is missing. You can put this data into a program and your machine, when applying fertilizer or soil correction, can apply it there, via satellite”*. Another winemakers affirmed: *“The quality of life of my teamwork is improved, because we can now regulate water distribution and pesticide irrigation from our homes”*. Moreover, thanks to GPS systems, workers' safety is reinforced, because they allow to avoid human activities when adverse weather conditions arose. Accordingly, digitalization contributes to attain service innovations both in agricultural processes and in the overall value propositions stimulating the development of innovative sustainable practices. Firstly, the large amounts of data collected and analysed allows to better dose the water use and to introduce a more precise application and reduction of chemicals, tracking the path for the implementation of non-polluting pesticides, herbicides, and fertilizers. A winery owner affirmed: *“We can finally improve our complex agricultural activities, by monitoring physical, chemical and biological processes so taking into the account what is the best for our wineries”*. Secondly, winemakers innovate the value proposition, by proposing certificated eco-friendly products. More in depth, thanks to bio-organic productions, an eco-label certificates the sustainable practices throughout the production cycle, from natural resources management to bottling and transportation. The winery eco-label certification enables the traceability of the product, by improving its quality, in terms of origin and sustainable production processes (e.g., vines protection, watering, fertilizer use, harvesting, winemaking, bottling, etc.), reinforcing its safety and reliability along the food value chain. Indeed, a winemaker affirmed: *“The digitalization of production data enables automatic transfer of data to our customers, enabling them to profit from better and more reliable data”*. At network level, these practices have generated renewed and extended close collaborations with the value system's actors: such as suppliers of ecological raw materials, agronomists, biologists, and software engineers. A winemaker stated: *“We activated new partnerships and new close relationships to share knowledge and experience in realizing sustainable solutions able not only to reduce unnecessary costs, but also to generate value for society”*.

Winemakers' digital readiness is stimulated through interactive services, that Elaisian provides through user-friendly interfaces such as machine visual boards and mobile applications (i.e., mobile apps), that allow an easy access to data. Besides, skilling and up-skilling services are provided to facilitate technical knowledge in big data analysis. According to the Elaisian CEO: *“Training our partners is fundamental to allow them in leveraging the value of digital technologies.... To make data useful information, it is needed a continuous learning through various techniques, such as foresight exercises and scenario building”*. On the other hand, winemakers are aware about the need to invest in digital skills, to maximize the potential in acquiring and elaborating information from data. At this regard, a winery owner declared: *“The ability to analyze data should be associated with methodological sensitiveness: data analysis can be source of many bias: not only we should collect information, but we should compute and interpret data in line with strategic goals to identify solutions for the development of services, products and processes”*. Then, the systematic computation and interpretation of data could allow winemakers to develop forecasting ability, so that they can in advance predict any possible disfunctions.

5. Discussion and implications

The quantitative and qualitative analysis allowed us to explore how sustainable gains are achieved when farming businesses, particularly wineries, embrace a digital transition orchestrated by a digital service platform. By combining the quantitative and the qualitative phases, we detected socio-technical dynamics of change in the companies involved in the transformation operated by a service platform provider.

The comparison between conventional *versus* 4.0 farms, showed that investing in precision agriculture systems generate cost savings, thereby positively affecting both the economic and environmental value. Particularly, the reduction in the use of pesticide treatments and fertilisation, such as the reduction of chemical inputs in the air and in the soil, increased not only wineries' profitability, but it also affected ecological sustainability. Nevertheless, a smaller reduction in the quantity and costs of pesticide treatments and fertilisation is noted in 4.0 companies rather than conventional ones. This could be explained by the average lower technological capabilities and knowledge of organizations analysed, which probably don't exploit the maximum benefits from the smart farming services. Probably, also climatic trends of the last two years, which have caused an anomalous negative trend in crop cycles, can be an explication of this reduction.

Despite all, findings from the case studies analysed, showed a strong sustainability orientation of entrepreneurs as well as the need to innovate their business to actively resolve sustainability issues.

Then, digitalization allowed them to realize service innovation at operative and business levels, by better performing agricultural processes and by proposing and communicating a new value proposition. On the one hand, agricultural processes are renewed and innovated towards bio-organic productions, where energy and natural resources are responsibly exploited; on the other hand, certificated eco-friendly products are designed, which improve quality and traceability. At the same time, social well-being is sustained, by enhancing workers' quality of life and safety, and increasing digitally specialised labour; thus, workers can perform less strenuous and more specialised tasks. All in all, the optimisation of back and front-end activities is sustained by the value received from the platform provider, in terms of both technological and knowledge support, by creating opportunities for innovation and supporting their implementation. Indeed, digital platform facilitated the extension of wineries' relational system, where new collaborations and co-created partnerships are embraced, which allowed a value network transformation. Wineries' organizations embraced new value creation modalities, by engaging eco-friendly professionals (e.g., suppliers of ecological raw materials, agronomists, biologists, software engineers) thereby going beyond the agri-food supply chain. Consequently, new knowledge, experience, and expertise are exchanged and potentially renovated, through a continuous learning process in the actors' value network. Then, a virtuous cycle of knowledge exchanges is stimulated and a constant tension towards knowledge

recombination is developed. In sum, through the enrichment of data analytics skills in the whole winery organization, market intelligence activities are improved, which stimulate the activation of new modalities of interactions that boost ecosystem responsiveness in achieving sustainable innovations.

Past literature demonstrated that standalone interventions are often not sufficient to tackle digital transformation processes from a systemic perspective (Brunetti *et al.*, 2020). This is particularly true in the case of SMEs that need partners to integrate their capabilities, by considering that operate in complex contexts characterized by transitional processes such as the agrifood industry (García-Álvarez de Perea *et al.*, 2019).

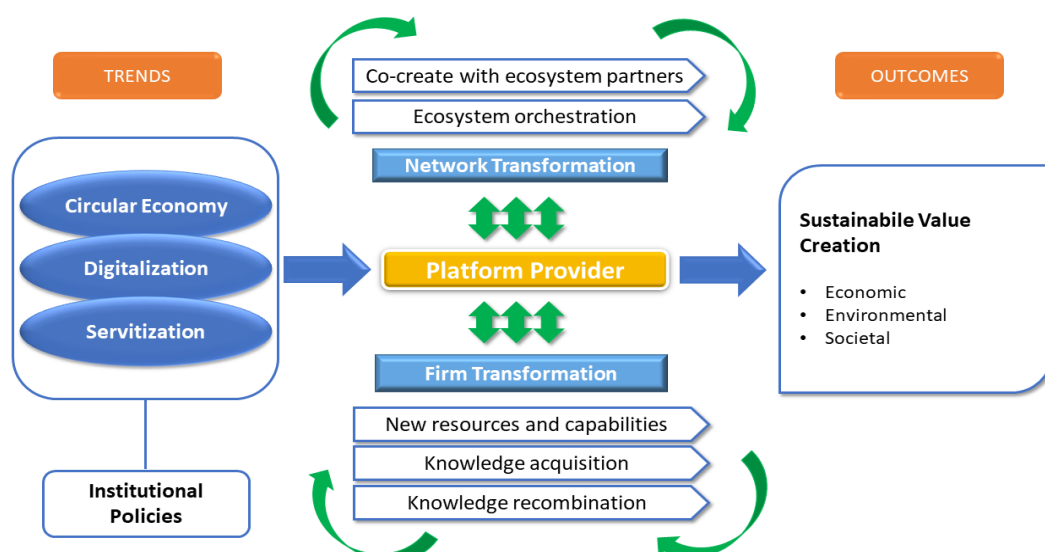
Tracking, measuring and then identifying innovative solutions to shared problems is the key to facing common challenges and foster sustainable outcomes in fast changing contexts (Kamilaris *et al.*, 2017).

5.1 Revised conceptual model

The evidence obtained both from the quantitative and qualitative analysis allowed us to update and improve the initial conceptual framework thanks to the deep empirical analysis performed. As Figure 2 shows in the revised conceptual model, the initial two levels of analysis (Paiola *et al.*, 2021; Parida and Wincent, 2019) were confirmed and enriched by further elements: (1) at network level the ecosystem transformation brought by the platform provider gives an actual boost to the value co-creation among partners. This interplay, based on the exchange of information, and resources among the different actors is enabled by the ecosystem orchestration performed by the platform provider (Rapaccini *et al.*, 2023). These dynamics positively affect the competitiveness at the network level and impact on the overall sustainable value creation. At firm level (2), this transformation allows to overcome corporate lacks in terms of resources, especially in SMEs. The ongoing support technical and human received, stimulate innovativeness by knowledge acquisition and new knowledge recombination triggering innovative processes (Ayre *et al.*, 2019). This transformation represents for firms a concrete lever for achieving competitive advantage by servitizing their value propositions (e.g., organic and quality labelled products) and the communication of higher sustainable performance.

Our results stress the fact that this innovation ecosystem characterized by digital servitization, and positive network effects (Bronson, 2019) was proved to positively influence different levels of outcomes in terms of economic, environmental, social, but also at the societal level (Paiola *et al.*, 2021; Smania *et al.*, 2022).

Fig. 2: Conceptual framework updated by the research evidence



Source: our elaboration

6. Conclusion, limitations, and future research

The results obtained through the mixed-method design of this study allowed a direct comparison between secondary data and primary ones. In the first case, data have been standardised for “typical companies” and represent a guideline for comparative analyses of agrifood companies’ operations management performance in the wine-growing business. Primary data from case studies are more representative of the current Italian scenario of winery companies implementing smart farming services.

Particularly, in the case studied, significant benefits in terms of sustainable outcomes were observed for companies using smart farming services, which are, however, supported by the continuous training offered by the platform provider. In this way, companies contribute positively to both the society and the environment by improving the sustainability of production processes innovating with highly efficient and cost-effective systems both in terms of business and collective well-being, thanks to the observed network effects.

The synergic interplay with the service provider allows wineries to exploit the platform value by acquiring and exchanging knowledge in their value network towards an improvement of sustainable outcomes both at firm and network levels.

Consequently, this study can contribute also to empowering managers with some insights on the proper combination of data management strategies and human resources management to encourage the transformation of meaningless data into relevant knowledge and stimulate, in turn, the harmonization of complex innovation processes that impact on the sustainability of the firm and, potentially, of other stakeholders connected to it.

As per the limitations of the study, our evidence is mainly based on the analysis of Italian wineries enhanced by a specific innovative platform provider. More case studies are needed to generalize transformation dynamics and outcomes. Further research could focus on other agrifood industries or niches in different geographical areas as well as different types of platform providers and related business models, in which different sustainable benefits could be achieved.

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APPENDIX

Tab. 5: Profit and loss account - Without 4.0 services

FARM NOT USING 4.0 SERVICES	1 Ha	2 ha	20 ha	100 ha
COSTS				
Fertilisers	500,00 €	1.000,00 €	10.000,00 €	50.000,00 €
Fertilisation	160,00 €	320,00 €	3.200,00 €	16.000,00 €
FERTILISERS TOTAL COST	660,00 €	1.320,00 €	13.200,00 €	66.000,00 €
No. of pesticide treatments	10	20	200	1000
Pesticides	780,00 €	1.560,00 €	15.600,00 €	78.000,00 €
Pesticides transport and distribution	520,00 €	1.040,00 €	10.400,00 €	52.000,00 €
PESTICIDES TOTAL COST	1.300,00 €	2.600,00 €	26.000,00 €	130.000,00 €
OTHER OPERATIONS TOTAL COST	5.630,00 €	11.260,00 €	112.600,00 €	563.000,00 €
Total cost Vinification and bottling	4.086,00 €	8.172,00 €	81.720,00 €	408.600,00 €
TOTAL COST WITHOUT 4.0 SERVICES	11.676,00 €	23.352,00 €	233.520,00 €	1.167.600,00 €
INCOME				
Grape production q/ha	100	200	2000	10000
Wine production l/ha	6500	13000	130000	650000
Price €/l - Non Organic	3,45	3,45	3,45	3,45
Price €/l - Organic	5,75	5,75	5,75	5,75
TOTAL INCOME NON-ORGANIC WITHOUT 4.0 SERVICES	22.425,00 €	44.850,00 €	448.500,00 €	2.242.500,00 €
TOTAL INCOME ORGANIC WITHOUT 4.0 SERVICES	37.375,00 €	74.750,00 €	747.500,00 €	3.737.500,00 €
PROFITS NON-ORGANIC WITHOUT 4.0 SERVICES	10.749,00 €	21.498,00 €	214.980,00 €	1.074.900,00 €
PROFITS ORGANIC WITHOUT 4.0 SERVICES	25.699,00 €	51.398,00 €	513.980,00 €	2.569.900,00 €

Tab. 6: Profit and loss account - With 4.0 services

FIRM USING 4.0 SERVICES	1 Ha	2 ha	20 ha	100 ha
COSTS				
Fertilisers	350,00 €	700,00 €	7.000,00 €	35.000,00 €
Fertilization	112,00 €	224,00 €	2.240,00 €	11.200,00 €
FERTILISERS TOTAL COST	462,00 €	924,00 €	9.240,00 €	46.200,00 €
No. of pesticides treatments	5	11	108	540
Pesticides	421,20 €	842,40 €	8.424,00 €	42.120,00 €
Pesticides transport and distribution	280,80 €	561,60 €	5.616,00 €	28.080,00 €
PESTICIDES TOTAL COST	702,00 €	1.404,00 €	14.040,00 €	70.200,00 €
OTHER OPERATIONS TOTAL COST	5.630,00 €	11.260,00 €	112.600,00 €	563.000,00 €
Total cost Vinification and bottling	3.927,00 €	7.585,00 €	74.620,00 €	369.869,00 €
SMART FARMING SERVICES TOTAL COST	500,00 €	500,00 €	2.700,00 €	7.500,00 €
TOTAL COST WITH 4.0 SERVICES	11.221,00 €	21.673,00 €	213.200,00 €	1.056.769,00 €
INCOME				
Grape production q/ha	106	212	2120	10600
Wine production l/ha	7420	14840	148400	742000
Price €/l - Non Organic	3,45	3,45	3,45	3,45
Price €/l - Organic	5,75	5,75	5,75	5,75
TOTAL INCOME NON-ORGANIC WITH 4.0 SERVICES	25.599,00 €	51.198,00 €	511.980,00 €	2.559.900,00 €
TOTAL INCOME ORGANIC WITH 4.0 SERVICES	42.665,00 €	85.330,00 €	853.300,00 €	4.266.500,00 €
PROFITS NON-ORGANIC WITH 4.0 SERVICES	14.378,00 €	29.525,00 €	298.780,00 €	1.503.131,00 €
PROFITS ORGANIC WITH 4.0 SERVICES	31.444,00 €	63.657,00 €	640.100,00 €	3.209.731,00 €

Some methodological remarks for a sustainable management – An explainable artificial intelligence paradigm approach

ERNESTO D'AVANZO*

Abstract

Framing of the research. This research discusses the application of sustainable management (SM) concepts, which integrate economic, social, and environmental aspects, to decision-making processes using artificial intelligence (AI) methodologies. The proposed framework utilizes decision trees to learn sustainable practices in strategic areas, such as healthcare and corporate balance sheet management.

Purpose of the paper. The research aims to use AI methodologies, specifically decision trees, to induce sustainable practices in decision-making processes. The research also seeks to capture “common sense knowledge” from data, which has been a challenge for AI since its foundation as a discipline.

Methodology. The proposed methodology uses decision trees, a well-known AI methodology, to automatically generate a set of rules (i.e., practices) that satisfy the pillars of sustainability. The rules are learned from data coming from different sources in strategic areas such as healthcare management and corporate balance sheet management. The approach aims to capture “common sense knowledge” from data, which has been a challenge for AI since its foundation as a discipline.

Results. The proposed methodology allows decision-makers to explore the underlying processes with greater awareness and trust, overcoming the opacity and uncertainty of typical black box strategies offered by some AI solutions. Overall, the paper proposes an explainable AI methodology that captures common sense knowledge without losing methodological rigor, to support sustainable decision-making.

Research limitations. A limitation of this paper is represented by the intervals of data that should be introduced in order to get a better classification and, as a consequence, a better decision-making process.

Managerial implications. By learning a set of sustainable practices from data in strategic areas such as healthcare management and corporate balance sheet management, decision makers can make better decisions that satisfy the pillars of sustainability. The framework also addresses the challenge of capturing common sense knowledge from data, which has been a challenge for AI since its foundation. By providing interpretable rules or practices, decision makers can have a better understanding of the underlying processes and greater trust in the decision-making process.

Originality of the paper. The proposed methodology is an “explainable AI” that makes it possible to capture common sense knowledge without losing methodological rigor. The paper also emphasizes the importance of sustainable practices and how they can benefit current and future generations while limiting the depletion of natural resources. Strategic areas such as healthcare management and corporate balance sheet management are identified as areas where sustainable practices are more than desirable.

Keywords: Sustainable management; decision trees; Explainable AI (XAI); Healthcare best practices; Balance sheet management best practices.

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1. Introduction

As known, sustainable management (SM) borrows the concepts from *sustainability* and merges them with the those of *management*. From sustainability, SM borrows the three «pillars» (i.e., economic, social and environmental). In particular, as regards the *social* pillar, it is sometimes read in the broader context of «generations», namely: respect the needs of present and future generations. In other words, by adopting these «pillars», SM lays the foundations for a conceptual framework based on economic vitality and which, while taking into account the needs of present and future generations, seeks to limit the depletion of natural resources.

Starting from the conceptualization of SM just mentioned above, the purpose for which the new discipline was born also emerges, that is to elaborate the application of «sustainable practices», in various fields of human action, such as businesses, agriculture, the environment and, in general, to personal life, trying to manage these areas in a way that current and future generations can benefit from them (Gill and Germann, 2022; Mio et al., 2020; Rockström et al., 2009)

The paper discusses how an artificial intelligence (AI) methodology, can aid decision making processes, through the «induction» of *practices* (Sikora et al., 2019), that satisfy the *pillars* of sustainability, in the form of simple «rules» (i.e., *if-then rules*, *heuristics*, *rules of thumb*). The rules are automatically generated from *decision trees*, a well-known AI methodology (Safavian & Landgrebe, 1991). In particular, the framework, introduced in this paper, is oriented to learn a set of «practices», from data coming from different sources, in some strategic areas such as *healthcare management* and *corporate balance sheet management*, where «sustainable practices» are more than desirable.

In fact, these areas present problems of such magnitude as representing limits, for instance, to Italy economic and digital development.

The conceptual framework proposed in the following shows how to capture, among other things, «common sense knowledge» from data. Capturing «common sense» has represented a challenge for AI, since its foundation as a discipline, and a solution for the construction of machines «assisting men in theoretical or practical tasks of varying complexity» (Holzinger et al, 2019). To this end, the paper also shows how «common sense knowledge» can «support sustainable decision making» thanks to the employment of an AI methodology.

As said, the proposed approach will provide a set of *rules* (i.e., *practices*), which can be interpretable by human beings, overcoming the «opacity» and «uncertainty» of the typical «black box» strategies offered by some AI solutions, such as, for example, *deep learning* (Adadi & Berrada, 2018), allowing decision makers to explore the underlying processes with greater *awareness* and *trust*. Overall, the proposed methodology makes it possible to capture the «common sense knowledge» without losing methodological rigor. In other words, the AI methodology discussed below allows to see the internal decision-making process through a «glass box», so much so that it can be fully defined as an «explainable AI» (Adadi and Berrada, 2018)

2. Background

2.1 AI and common sense

The widespread adoption of AI is often achieved by increasing complexity. These performative systems, in fact, are «black boxes», and for this reason they are criticized for the uncertainty with which they lead to decisions (Wadden, 2022) This criticality is particularly insidious when information or decision support systems are used in sensitive domains, such as *healthcare* or *corporate management*. The way of «explainable AI» (Linardatos et al., 2020) deals with promoting the use of AI methodologies capable of interpreting the automatic learning models used, for instance, under form of «simple» and «explorable» users' friendly rules. The methodologies, which in the following are presented in two areas of investigation (i.e., *healthcare* and *balance sheet*

management), will show the formulation of «best practices», or «heuristics», for each specific area, which can be easily explored by decision makers, without requiring any technical skills in the field of AI and/or information systems. For instance, healthcare professionals, managers and, in general, policy makers, of the fields examined, will have best practices at their disposal, in the form of simple rules, that have been formulated through the application of AI algorithms that make use of the «best evidence» available in the data at disposal.

As the data changes over time, the algorithms that work in the background allow the extraction of new rules based on new data available. The nature of these methodologies, mainly based decision trees (Kingsford and Salzberg, 2008) may allow policy makers to explore the underlying processes and use them with greater awareness. The methodologies proposed have a peculiarity: they allow to capture the «common sense knowledge» (McCarthy, 1986) without losing in terms of methodological and scientific rigor. Capturing common sense has represented a challenge for AI, since its foundation as a discipline, but also a solution for the construction of machines «assisting men in theoretical or practical tasks of varying complexity».

The intersection of AI with other disciplines, and the consequent birth of cognitive science, has made it possible to recognize, among other things, the role played by human reasoning in the creation of artifacts. However, the fact that simple «cognitive shortcuts» (Madison et al., 2021), used to solve problems, or discover scientific laws, was already known to the founding fathers of AI. The new discipline introduced notable advances when it showed the «cognitive plausibility» of taking such «shortcuts». Furthermore, thanks to the ever-increasing effectiveness of its methodologies, AI has allowed the generation of such rules, starting from the large quantities of data available. Data that hide a lot of «common sense» within them.

As we will see below, these rules are particularly useful in the cases of training programs, as well as exhibiting useful criteria to support sustainable policies.

2.2 The Explainable AI: opening the «black box»

Explainable AI (XAI) is an emerging field in AI that focuses on developing algorithms and models that are transparent and understandable to humans. The goal of XAI is to make AI systems more *trustworthy*, *accountable*, and *usable* by enabling users to understand how the systems work and why they make certain decisions (Langer et al., 2021).

Among the applications of explainable AI, for instance, there are those in *healthcare*, *finance*, *criminal justice*, *customer service*, and many others. For example, in *healthcare* applications, XAI can be used to develop predictive models that can assist clinicians in diagnosing and treating patients. These models can be made more interpretable and transparent by including feature importance rankings, visualizations, and explanations of the underlying algorithms. *Finance* applications may benefit from XAI because it can improve the *trustworthiness* of the financial system and help to mitigate the *risks* of financial crises. *Criminal justice* exploits XAI to deploy AI systems that are *transparent* and *explainable* to judges and juries. This can help to reduce *bias* and increase *fairness* in the criminal justice system. As for *customer service*, XAI can be used to develop chatbots to increase user experience and help customers to understand how the AIs make *recommendations* or provide *assistance*.

Overall, the applications of XAI are numerous, and they all aim to make AIs more *transparent*, *interpretable*, and *trustworthy*. By enabling users to understand how AIs work and why they make certain decisions, XAI can help to address some of the ethical and social concerns associated with AI, such as *bias*, *privacy*, and *accountability*.

XAI methodologies/techniques. There are several methodologies and techniques used in XAI. *Rule-based* systems, for instance, use a set of predefined *rules* to make decisions. The rules are transparent and easy to interpret, making them well-suited for XAI applications. Such methods, however, may not be as flexible or accurate, for reasons that we introduce later, and ask for more efficient rules-based approaches, able to learn straightforward from data. *Local Interpretable Model-Agnostic Explanations* (LIME) is a technique that generates *local explanations* for *black-box*

models by approximating the model with a simpler and more interpretable model in the proximity of a specific data point. LIME can be used with any *black-box* model and is computationally efficient. *SHapley Additive exPlanations* (SHAP) is a technique, based on *game theory*, which assigns a score to each feature in a model weighting its contribution to the output. SHAP can be used to explain the output of any model and provides both *global* and *local explanations*.

Decision trees (DTs) represent a type of model that uses a hierarchical structure of *decisions* to classify data. DTs are easy to understand and interpret, and can be used for both classification and regression tasks. DTs and rules-based systems move on a common ground. Indeed, *paths* on decision trees' branches, from *root node* to *leaves*, may be read as *if-then rules*, that are sets of *logical statements* representing the conditions under which a particular *action* should be taken. They are transparent and easy to understand, making them a popular choice for XAI systems. *If-then rules* (also as a way to read DTs' outputs) can be used to represent complex decision-making processes and can be easily modified as new data become available. Overall, the methodologies and techniques used in XAI aim to make AI more *transparent* and *interpretable*, enabling users to understand how the system works and why it makes certain decisions. By providing explanations for the output of AI systems, XAI can help to increase *trust*, reduce *bias*, and improve *accountability*.

XAI and the scientific method. XAI and the *scientific method* are closely related as they both aim to develop a better understanding of the world around us, through *empirical observation*, *hypothesis testing*, and the development of *transparent* and *interpretable models* (Gunning & Aha, 2019). For instance, XAI starts by formulating a *hypothesis* about how the AI model works and how it makes decisions. After this step, it is expected the data collection on the AI model's performance and behaviour, as well as information about the input variables and the output predictions. Subsequently, data are analysed to test hypothesis and to identify patterns and relationships. Based on the previous analysis, conclusions can be drawn about the AI model's behaviour and decision-making processes. They may also develop new hypotheses and models based on their findings. In particular, they be suggested *counterfactual explanations*, in order to show how the model output would change if the input features were changed in a specific way. *Counterfactual explanations* are particularly useful to understand the *sensitivity* of the model to different inputs and to test the *robustness* of the model (Stepin et al., 2021).

Implications for management science. As is well known, *management sciences* are always on the lookout for methodologies and techniques to identify solutions to complex problems by using mathematical models and algorithms (Zhang et al., 2022). Since *management science* is an interdisciplinary field that applies scientific methods and techniques to management problems, it may benefit from the adoption of XAI, which can be applied in management science to develop AIs, transparent and explainable, allowing managers to understand how the system is making decisions and to identify areas for improvement. For example, XAI can be used to develop models to predict, among others, consumer demand (Khrais, 2020), supply chain disruptions (Nimmy et al., 2022), employee turnover and so on. By making these models transparent and interpretable, according to XAI, managers can better understand the factors that drive the predictions and make more informed decisions.

Ethics implications and sustainability. XAI, as mentioned above, can be applied in various ways to support management science, but it is also helpful to address questions that arise from ethics, besides supporting sustainability. For instance, XAI can be used to promote ethical decision-making by ensuring that AIs are transparent and accountable (Mcdermid, 2021). XAI seems also useful to develop models that identify potential *biases* or *discrimination* in hiring or lending decisions. In this case stakeholders can understand how the supporting AI is making its decisions and identify potential sources of bias or discrimination (Izumo and Weng, 2021).

Last, but not least, XAI can be applied to support *sustainable healthcare* decision-making by developing transparent and interpretable models that assist healthcare professionals in making informed decisions (Behera, 2023). For example, models could be developed to predict the risk of *hospital readmission*, *postoperative complications*, predict the *risk of adverse events* or

complications for patients (*patient risk assessment*). XAI models could be developed also to predict the likelihood of treatment success for different treatments (Gerlings et al., 2022), in order to help healthcare professionals understanding factors that influence treatment outcomes (*treatment decision-making*). Another important healthcare issue is represented by *resource allocation*, where XAI can help the prediction of demand for different healthcare services or resources. A possible example is a XAI model to predict the demand for hospital beds or medical supplies, to aid healthcare professionals to understand the factors that drive demand and make more informed decisions about resource allocation.

To sum up, XAI can be used to support sustainable healthcare decision-making by developing transparent and interpretable models that assist healthcare professionals by providing explanations for the output of AI systems, increasing trust, reduce bias, and improve accountability in healthcare decision-making.

2.3 Healthcare management

Both healthcare organizations and individual professionals favor «therapeutic paths» that are the product of individual experiences and knowledge rather than «shared protocols», with the consequence of producing a high degree of variability in the solutions to be adopted in the organization. The spread of ineffective and inappropriate treatments has given rise to the development and spread of «medicine evidence-based», or «evidence-based medicine» (Bornstein and Emler, 2001).

The central role of the patient, in that type of decision, led to the «shared decision making» paradigm, indicating that the physician and her/his patient, in deciding on the basis of the best evidence available, founded the decision making in a «sustainable» manner (Stiggelbout et al., 2012), overcoming the «lack of universality» and «unanimity» in the diagnosis and subsequent choice of treatment (Rischen et al., 2013).

In this context [...] have proposed a methodology for modeling health processes, which makes it possible to «explicit» the «tacit knowledge» used by physicians. *Rules*, in the medical field, were already known to the ancient Schola Medica Salernitana, a medieval medical school based in Salerno, South of Italy, that codified them in the *Regimen sanitatis Salernitanum* (The Salernitan Rule of Health), also known as *Lilium medicinae* (The Lily of Medicine).

The wise advice of the ancient physicians, contained as rules in the *Regimem*, had a rapid diffusion and the work was translated into many languages, precisely because its medical rules, in the form of rhymes, were easy to remember. *Rules* such as «post prandium aut stare aut lento pede deambulare», «post prandium stabis, post coenam ambulabis» or «prima digestio fit in ore» represented ideas and instructions for the protection of public and individual health. Sometimes they suggest real therapies. The work was written using terminology that everyone can understand, not just understandable only by ancient professional physicians. For example, it talks about *dietetics*, a branch of medicine that includes environmental health factors. Its rules were the product of collective reflections and inquires, which took into account social and environmental factors. Such was the trust in the transparency and authenticity of the *Regimem* that its legitimacy was valid until the beginning of the nineteenth century, despite the fact that medical science at that time had already made excellent progress thanks also to the instruments. On the whole, today we would say that the The Salernitan Rule of Health would have had the credentials in order with the three «pillars» of sustainability; all with a strong root in «common sense».

AI for sustainable healthcare management. In the following, the paper will introduce an AI methodology for modeling healthcare processes, which makes it possible to «explicit» the «tacit knowledge» used by healthcare policy makers. AI models are automatically generated in the form of simple and explorable *rules* (i.e., *heuristics*) extracted from *decision trees*. The methodology, in addition to support the choice of «satisfactory» healthcare pathways, includes components for the evaluation of costs using patient-based criteria. One of its main goals was to improve the degree of «within» and «between agreement» among healthcare policy makers, as well as validating the

heuristics generated through the tree. Experimental settings [...], introduces and discussed in Section 3, show some results obtained in terms of *accuracy*, *ease of use* and *speed* of the identified heuristics. Another goal of the experimentation was to reduce the number of *attributes* used to arrive at the healthcare decisions, which allowed a reduction of costs for services, concerning both diagnostic and clinical tests. As shown in the following, the implementation of a such experimental framework, based on this methodology, allows the delivery of «sustainable rules», that take into account costs, patient satisfaction and impact on the environment, according to the pillars of sustainability. Moreover, the proposed framework can provide refresher courses and training, thus establishing a collaboration among policy makers and professionals able to generate learning value. This further contributes to the sustainability of healthcare, if we agree that the sustainable healthcare model should also include the needs of healthcare personnel.

2.4 Corporate balance sheet management

The «alert procedure» provided by the *bankruptcy law reform* has offered a new stimulus to use tools to predict the probability of a company's bankruptcy.

The «business crisis» is a sensitive issue, both for businessmen and for those who deal with the all-round legal bankruptcy issue. In recent years, then, the issue has assumed increasing importance with the increase in the riskiness of economic activities and in relation to the effects of the economic situation, not to mention the effects that the covid-19 pandemic has unleashed on businesses.

As it is known, there is no single definition of a business crisis (Sheth, 2020) and, as such, the scientific literature offers numerous methods of investigation, precisely due to the variability of the types of companies, whose crises present different methods depending on the context. The *balance sheet analysis* represents the most immediate tool, which is used for the assessment of the state of health of the company. The analysis of business management, however, is a complex activity that can be conducted by adopting different observation perspectives in relation to the nature of the objectives.

Over the years, the scientific literature has looked for models which, starting from the analysis by balance sheet ratios, would make the crisis identifiable before its «burst», which would have at least anticipatory, if not forecast, characteristics.

Altman's Z Score, first released in 1968, is one of the best-known models. It is based on five balance sheet ratios representing the *liquidity*, *profitability*, *indebtedness* and *solvency* of companies. Altman's original score is applied to a sample of 66 listed American manufacturing companies (33 *healthy* and 33 in *potential distress*). It shows how firms with a Z score below 1.8 have high risk factors and, therefore, a high probability of *insolvency*; companies with a score higher than 3, on the other hand, turn out perfectly, while those whose score is between 1.8 and 3 indicate a grey area with uncertain outcomes.

Altman's model has undergone several revisions. The best known are the Z' and Z'' versions. The latter was applied to the Italian context and, in particular, to businesses subject to the extraordinary administration procedure. All attempts have shown the need to adopt ever more specific versions.

Even if the model shows remarkable forecasting efficiency, especially when compared to its application costs, the possibility of using this model must not neglect some aspects that deserve attention. First, even if it has a good forecasting capacity within one year from the analysed financial statement, it should not be used to make a judgment without appeal, also considering that it is a statistical model that «works on average»; second, it should be considered the Altman's score can produce either *false positives* or *false negatives* (Muñoz-Izquierdo et al., 2020).

On the other hand, business management also makes extensive use of the entrepreneur's «common sense» and «best practices» that management is able to bring out in the daily management of a business. As an example, it is worth recalling the well-known claim of Henry Ford, according to which «the two most important things do not appear in the balance sheet of a

company: its reputation and its men». The Also, Alan Greenspan, former chairman of the Federal Reserve Bank, in the middle of the subprime crisis, argued that «the essential problem is that of our models - both risk models and econometric models - as complex as they have become are still too simple to capture the full array of governing variables that drive global economic reality». Mr. Greenspan identified the weaknesses of the available models: «the underlying data used» do not seem to be able to represent «both periods of euphoria and periods of fear».

AI for the sustainable management of the corporate balance sheet. In the following, the paper shows the valuation of a «company's distress», employing decision trees, to «explain» target variables of interest, such as «zone of discrimination» and/or «cut off». The methodology allows the representation of decision processes according to paths on the tree's branches, readable as browsable *if-then rules*. The study also aims at examining whether and how AI may facilitate the comprehension of *corporate distress* and *corporate legality*. The combination of a new set of variables, that are not envisaged by *Altman model*, allows one to understand, within a given range of accuracy, company's financial health and company's distress, regardless of the *Altman Z-score* (Altman et al., 2020).

In fact, as known, Altman's model is easily applicable, constantly reviewed and re-evaluated by researchers and financial analysis institutes; then, it presents a remarkable forecasting efficiency, especially when compared to its application costs. Then, the alert procedure, provided for by the bankruptcy law reform, has offered a new stimulus to the use of the Altman Z-score as a useful tool to predict the probability of a company's bankruptcy (Munira et al., 2021).

The use of the Altman model, however, implies some aspects that deserve attention and that should not be neglected at all. First, the model identifies the probability of bankruptcy only within one year from the date of the analyzed financial statements. It is a statistical model «working on average». As such it can produce erroneous results (González and Corchado, 2021) in terms of «false positives» (i.e., labeling a healthy company as fallible), and «false negative» (i.e., labeling a company with a high probability of failure as healthy). Then, while adopting Z-score another issue that can emerge when it becomes the recognized standard for crisis prediction: it is possible that incentives will be generated to dupe the model. For example, some firms, aware of their state of crisis, could apply budgetary policies aimed at manipulating the model indicators. The bankruptcy reform law (Legislative Decree No. 14/2019), which has made mandatory the adoption of an «organizational, administrative and accounting structure», aimed at the timely detection of the crisis (art. 2086 Italian Civil Code), highlighted the importance of organizational forms of the enterprise that ensure the emergence of risk signals. The problem is that it often happens that such risk situations are not intercepted in time. That's why there is an urgent need to exploit AI methodologies, as those described in the following sections, to create neutral and automatic alert mechanisms, which can be activated if critical situations emerge during business activities. If these alert mechanisms work correctly, for instance, the supervisory boards can stimulate and/or incentivize the company to act in time to avoid the deterioration of the risk into something more serious and definitive.

[cit...] proposed a methodology, based on *decision trees*, to support the choice of satisfactory clinical pathways, and allow their monitoring.

The *heuristics* generated by the decision tree seem to satisfy the first part of the evaluation criterion introduced by Bodemer et al. (2015), the one concerning accuracy: they, in fact, explain the existing data, showing, at the same time, good generalization skills. The *tree* also satisfies the second part of the evaluation criterion: it is an intuitive, transparent and easy-to-use decision-making tool, as demonstrated by the ease in reading the rules. Last, but not least, element: it is generated very quickly, in the order of a few seconds, in line with what is required by the last part of the criterion of Bodemer and colleagues. To sum up, the procedure seems to follow the expectations of XAI introduced above in the paper.

3. Material and Method

The purpose of this section is to introduce two experimental frameworks in which *decision trees* have been employed. The two *frameworks* have been extensively described elsewhere [cit...]. In this context, however, they are proposed in a new light, namely that of the XAI. The common methodology based on *trees*, and corresponding *rules*, shows how these methodological-conceptual tools lend themselves particularly well in the two tasks assigned to them, which contemplate, in one way or another, the automatic generation of rules that can support management (i.e., *healthcare* and, in general, *business*) in daily routine tasks, based on *intuitive, understandable*, but at the same time *rigorous methods*.

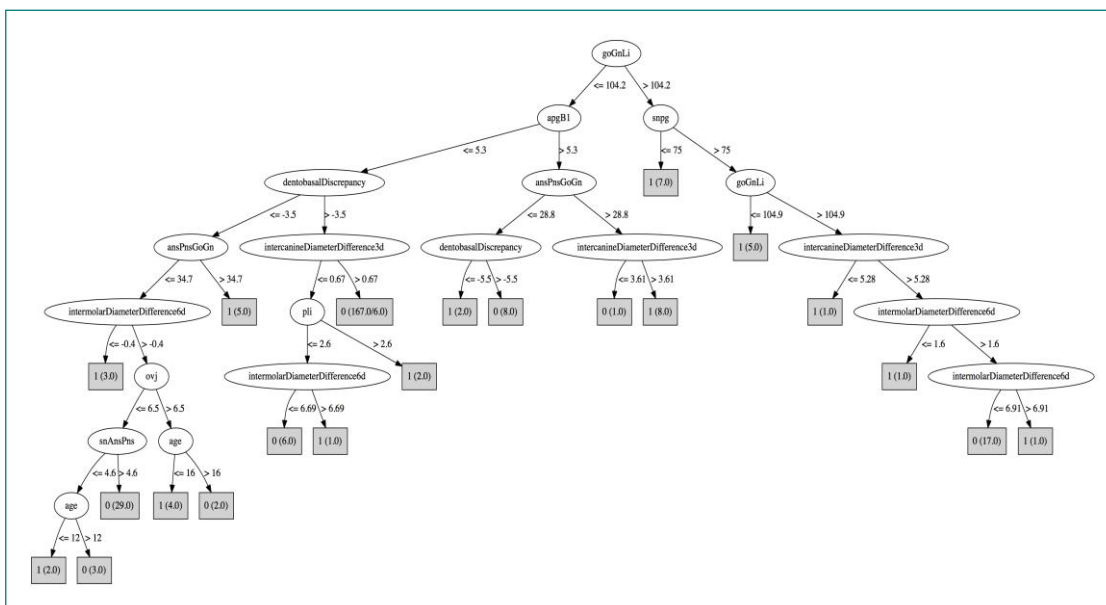
The proposed XAI methods, in addition to being particularly useful in terms of *sustainable management* (in particular in the *healthcare case study*), thanks to their *transparency* and *intuition*, allow to review different techniques used in management from different perspectives, to the point of allowing the visibility of *factors* that until now had not been considered (*corporate balance sheet management case study*)

3.1 Healthcare case study: data and method

Data - The dataset used for the experimentation refers to the collective contribution of various scholars of the *School of dentistry*. Each researcher and/or practitioner built his own dataset, which was then merged with that of the other colleagues, after having detected, for each patient, 39 *attributes/variables* common to all, including a *class label*, which indicates the type of treatment administered, i.e., the *extraction* or *non-extraction* of teeth.

The dataset consists of 290 patient records, ranging in age from 8 to 53 years, an average of 15.59 years, with no previous orthodontic intervention. There are 232 *negative* examples, i.e. cases in which there was *no extraction*, while there are 58 *positive* examples, in which *extraction* took place. Overall, the distribution of data is asymmetrical with respect to the *non-extractive* class. Patient characteristics are of four types (*skeletal, clinical, radiological, and functional*).

Fig. 1: Decision tree generated from the dataset provided by the School of Dentistry



Method - To generate the DT, *C4.5* was used, an implementation of the algorithm created by Ross Quinlan in 1993. *C4.5* classifies the cases, i.e., the data from the patient's medical records, sorting them from the *root* to the *leaf nodes*, where it provides the classification of cases into *extractive*, denoted by 1, or *non-extractive*, denoted by 0, as reported on the tree of Figure 1. The

nodes of the tree specify the «controls» for the attributes that describe the cases, such as *goGnLi* to the root node of the tree. The *branches* descending from the nodes correspond to one of the possible values that an attribute can assume; for example *goGnLi*, again in Figure 1, can assume two sets of possible values, those with ≤ -104.2 and those with value >-104.2 . The same process is repeated for the subtree rooted in the new node. Looking at Figure 1, after testing *goGnLi* at the root node, C4.5 «jumps» to the right and left branches, based on the two sets of values that the root function can assume, and tests, respectively, for the *apgB1* attributes and *SNPGs*.

In order to assess the «generalization» ability of models built from decision trees, C4.5 makes a pessimistic assessment of the performance of a model trained on *n* samples. In other words, rather than choosing a single model, the choice was to fit the model to all the data, to provide a conservative estimate of the model’s performance (Mitchell, 1997).

The experiments were conducted using different evaluation parameters, in order to test both the ability of trees to «explain» existing data and their ability to generalize when new data arrives, taking into account of the evaluation criterion suggested by Bodemer and colleagues (2015). For example, accuracy has been employed to measure how often a decision tree makes the correct prediction.

A result that emerges from the reported experimentation is the improvement in the level of *agreement* among orthodontists, when they resort to the *heuristics* automatically generated by the *decision tree*. The second result, on the other hand, concerns the number of *attributes* used to arrive at the orthodontic decision. In fact, all the *rules* chosen by the physicians are found in the upper part of the *decision tree*, and taken together they show how, for the purposes of decisions, only a small number of *attributes* are necessary, about 10% of the initial 38 variables present in the charts clinics. In this sense, orthodontists seem to apply *Occam’s razor*, adopting the simplest *hypothesis* (under form of heuristic), capable of «explaining» the available data, also behaving like other scientists who have a bias towards simple «explanations» rather than more complex ones. Furthermore, an analysis of variance (ANOVA) shows how all the attributes found in the upper part of the decision tree, and chosen by the physicians for their decisions, are those with significant statistical differences ($p < 0.05$); the ANOVA, therefore, is another evidence that confirms, in statistically relevant terms, the choice of these attributes. This is a counter example to the thesis of Turpin and Huang (2016), who argued the lack of scientific evidence for the dental task. In support of this, for example, Mitchell (1997) argues that the preference by physicians for the simplest hypotheses/heuristics is dictated by the fact that they allow both to «explain» existing cases and, at the same time, to generalize on new cases.

In terms of management efficiency, the reduction in the number of *attributes*, needed for biomedical decision making, automatically translates into a reduction in the costs of services, both for diagnostic and clinical tests. All with significant savings for the health system as a whole. Furthermore, the methodology proposed makes it possible to trace adherence to the extrapolated model and provide real-time feedback on deviations and possible alternatives, thus incorporating cost assessment models, according to patient-based criteria, based on procedural-type detection methodologies.

Tab. 1: The rules generated by C4.5, readable in the form of if-then rules

Rule n.	goGnLi	snpG	goGnLi	intercanine diameter difference	apgB1	Ans-Pns^Go-Gn	dentobasal Discrepancy	Class	% of waste reduction (cost/waste)
1	>104,2	>75	>104,9	<=5,28				1	-30/-65
2	<=104,2				>5.3	<=28,8	<=5,5	1	-30/-65
3	<=104,2			>3,61	>5.3	>28,8		1	-30/-65
4	>104,2	<=75						1	-50/75

Table 8 reports on some rules identified by the tree; let’s remember that each rule represents a path from the root to the leaf of the tree. As is shown on Table 1, the physician, professional or researcher, instead of using 38 variables to make his own decision, he uses from 2 (rule 4) to 4

variables (rules 1, rule 2 and rule 3). All factors/variables are identified by the algorithm and evaluated in terms of accuracy by same physicians. Table 1 also shows a reduction both in terms of cost of the treatment and in terms of solid waste produced (on the last column - % of waste cost and waste reduction). The format could represent the privileged toolbox of the physician to choose the rules to use in his practice without resorting to any computer support. The orthodontists may observe the sustainability of the best practice/rule chosen both in terms of cost and waste reduction.

The framework introduced above could identify *sustainable rules*, in terms of costs, *patient satisfaction* and environmental impact, to scholar and practitioners, providing refresher courses and training for Orthodontic Schools, thus establishing a collaboration among orthodontists and generating learning value. Overall, it could represent a contribution to a more sustainable healthcare, if we agree with that the sustainable healthcare model should also include the needs of healthcare personnel.

3.2 Corporate balance sheet management case study: data and method

Data - The *dataset* employed is composed by the information of 6.005 Italian companies extracted from Bureau van Dijk AIDA. The data to calculate the Z' score refer to the 2016 financial year

Some of the key features of the AIDA dataset for Italian companies include:

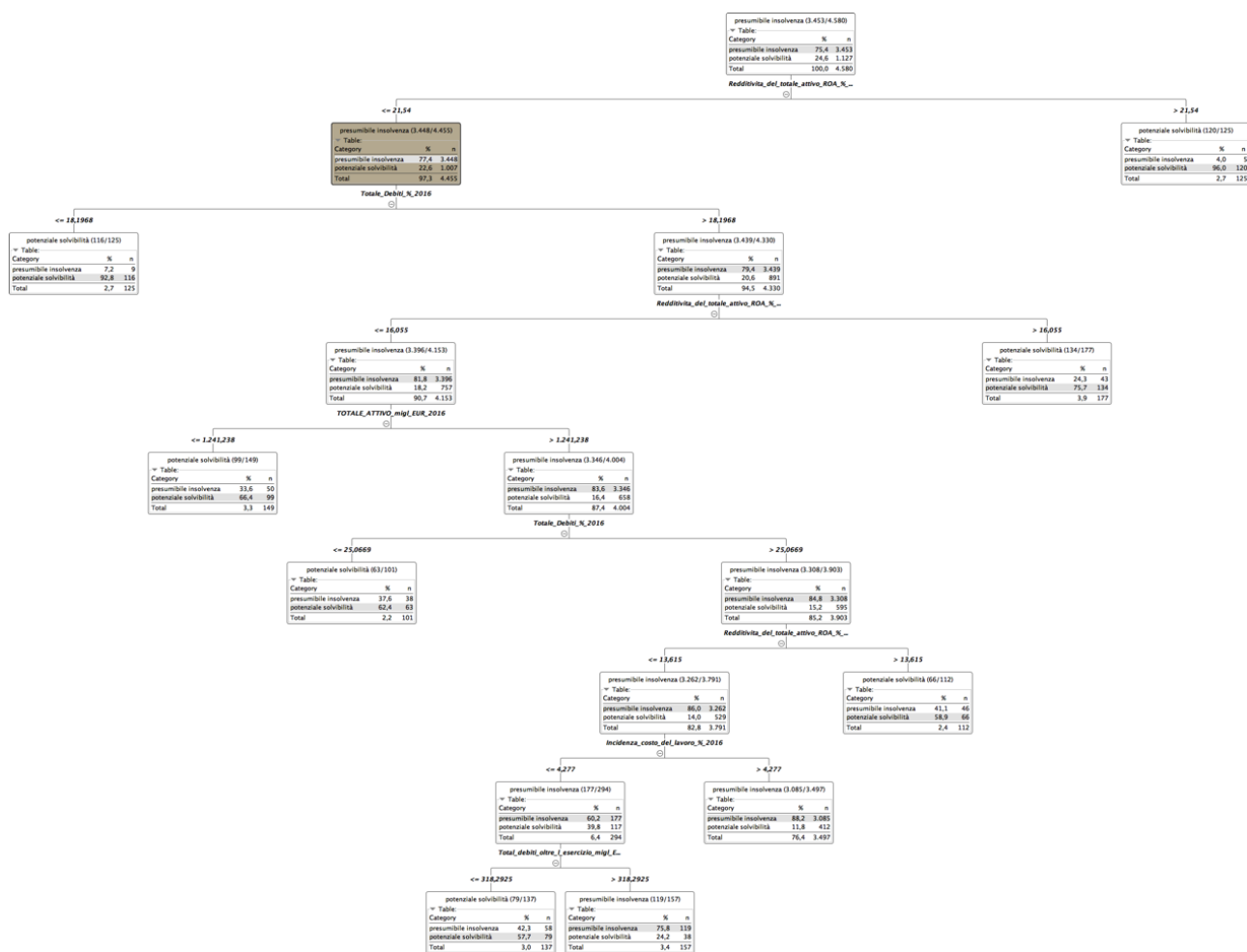
- detailed company profiles, including information on *company size*, *industry classification*, *geographic location*, and *ownership structure*;
- data such as *income statements*, *balance sheets*, and *cash flow* statements for Italian companies, as well as key financial ratios and benchmarks;
- AIDA provides information on ownership structures of Italian companies, including the identities of major shareholders and the percentage of shares held by each;
- legal Data such as *lawsuits*, *judgments*, and regulatory actions against companies;
- the dataset includes news articles and press releases related to Italian companies, as well as industry news and analysis;
- AIDA also provides access to a range of market research reports related to Italian companies, including *industry profiles*, *market trends*, and *competitor analysis*.

Method - In this case study, *C4.5* classifies instances, i.e., companies' records, always by sorting them down from the *root* to some *leaf nodes*, providing the classification of the *instances* according to the values of *cut-off* (or *zone of discrimination*) that can assumes two values: *possible distress* and *potential solvency* (safe, grey and distress zone – as for *zone of discrimination*).

For ease of reading, and to avoid disorienting the reader, the tree and the relative table of rules for the zone of discrimination case are deliberately omitted.

Nodes of the *decision trees* specify tests of some features describing the instances, such as *Redditività del_totale_attivo_ROA_%_2016* at the root node of the decision tree in Fig. 2.

Fig. 2: The tree assesses the «cut off» as target variable, whose values, in relation to Z' score, may be: potential solvency or possible distress. The goal is testing the «ability» of the algorithm to identify a combination of variables to predict the target without considering the variables «zone of discrimination» and «z score» in the dataset.



In the case of the tree depicted in Figure 2, the root attribute may assume two sets of possible values, those $\leq 21,54\%$ and those $> 21,54\%$. After testing the variable *Reddittività*, C4.5 jumps on the right and left branches, based on the two sets of value the root feature may assume, and, if it is the case, it tests other variables (e.g., *Totale_Debiti_%_2016* on the left branch) otherwise it stops. The process is repeated until a leaf node is reached, where the class label is present, such as in the tree represented in Fig. 2 where it corresponds to possible distress and potential solvency.

The experiments performed show the existence *if-then rules* (paths on the branches of the tree of Fig. 2) to predict the values of the cut off (i.e., potential solvency or possible distress). The rules are reported on Table 2.

The variable “*Reddittività_del_totale_attivo_ROA_%_2016*”, that is ROA (*Return On Assets*), seems to play a key role in both cases, since ROA is at the root node of the decision trees. As is known, the relationship between ROA, EBIT, and total assets is complex and varies depending on the company and industry. In general, a higher ROA and EBIT relative to total assets suggests that a company is more profitable and efficient at using its assets to generate profits. Conversely, a lower ROA and EBIT relative to total assets suggests that a company may be less efficient and profitable.

Both experiments share another variable, which differently from the previous one, is not mentioned in the Altman’s Z’ score-model. This variable is *Totale_Debiti_%_2016*. Total debt as a percentage is a financial ratio that measures the proportion of a company’s assets that are financed by debt. It is calculated by dividing a company’s total debt by its total assets, and then multiplying the result by 100 to express it as a percentage. For equal invested capital, the higher the total debt the lower the equity. In other words, Total debt as a percentage works as a good predictor of the

features associated with the company's financial structure for both *zone of discrimination* and *cut off*.

Tab. 2: This table contains the list of 5 out of 8 rules identified using the tree reported in Fig. 2. Rules should be read as **IF** condition1 **AND** condition2 ... **THEN** Potential solvency (or potential distress). There is only one rule about potential distress (R5)

R1	IF \$Totale_Debiti_%_2016\$ <= 18.196832168335906 AND \$Redditivita_del_totale_attivo_ROA_%_2016\$ <= 21.54	THEN	Potential solvency
R2	IF TOTALE_ATTIVO_migl_EUR_2016 <= 1241.238 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 16.055 AND Totale_Debiti_%_2016 > 18.196832168335906 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 21.54	THEN	Potential solvency
R3	IF Totale_Debiti_%_2016 <= 25.066864783615408 AND TOTALE_ATTIVO_migl_EUR_2016 > 1241.238 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 16.055 AND Totale_Debiti_%_2016 > 18.196832168335906 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 21.54	THEN	Potential solvency
R4	IF Total_debiti_oltre_l_esercizio_migl_EUR_2016 <= 318.2925 AND Incidenza_costo_del_lavoro_%_2016 <= 4.276964813170087 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 13.614999999999998 AND Totale_Debiti_%_2016 > 25.066864783615408 AND TOTALE_ATTIVO_migl_EUR_2016 > 1241.238 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 16.055 AND \$Totale_Debiti_%_2016 > 18.196832168335906 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 21.54	THEN	Potential solvency
R5	IF Total_debiti_oltre_l_esercizio_migl_EUR_2016 > 318.2925 AND Incidenza_costo_del_lavoro_%_2016 <= 4.276964813170087 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 13.614999999999998 AND Totale_Debiti_%_2016 > 25.066864783615408 AND TOTALE_ATTIVO_migl_EUR_2016 > 1241.238 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 16.055 AND Totale_Debiti_%_2016 > 18.196832168335906 AND Redditivita_del_totale_attivo_ROA_%_2016 <= 21.54	THEN	Potential distress

Experiments are marked by the presence of other variables missing in Altman's Z' score-model: *Ricavi_vendite_e_prestazioni_migl_EUR_2016* (sales), *RISULTATO_OPERATIVO_migl_EUR_2016* (EBIT), and *Immobilizzazioni_%_2016* (Non-current assets %). *Sales*, also known as *revenue*, represents the amount of money a company earns from selling its products or services. Sales are an important indicator of a company's performance, as they reflect its ability to generate revenue and grow its business. EBIT, or Earnings Before Interest and Taxes, is a measure of a company's operating profitability before interest and taxes are taken into account. It is calculated by subtracting a company's operating expenses, such as cost of goods sold and operating expenses, from its revenue. Although EBIT is also present in the ROA formula, in this case it is considered its absolute value. It represents a good indicator to analyze the performance of a company's core operations without considering the impact on profit of the costs of the capital structure and tax expenses. Non-current assets ratio is given by the weight of non-current assets on total assets, and it indicates the long-term uses involved in business operations to generate income. This ratio pertains to the assessment of the financial position and, as such, means that, equal total assets, the higher the fixed assets the lower the current assets. Another experiment identified variables not included within Altman's Z' score-model: *TOTALE_ATTIVO_migl_EUR_2016* (total assets), *Total_debiti_oltre_l_esercizio_migl_EUR_2016* (Total debt due beyond the financial year), and *Incidenza_costo_del_lavoro_%_2016* (personnel costs ratio). *Total assets*, as known, describes the sum of everything a company or individual owns that has monetary value, including cash, investments, property, equipment, inventory, and other tangible and intangible items. It offers an overview of a company's or individual's financial position at a specific point in time. *Total debt due beyond the financial year* refers to the outstanding borrowings and obligations that a company or individual is required to repay after the end of the current financial year. This typically includes long-term debt, such as bonds, loans, and mortgages, which have maturities extending beyond the current financial year. The *personnel costs ratio*, also known as the *labour cost ratio* or *employee cost ratio*, is a financial metric used to assess the efficiency of a company's workforce by comparing its personnel costs to its total revenue. This ratio helps to determine the percentage of revenue that is used to cover employee-related expenses such as salaries, wages, benefits, and payroll taxes.

The experimental framework introduced show the usefulness of decision tree, and their *if-then* rules, to produce outcomes comparable to those obtained using Altman's Z' score.

The framework also demonstrates the possibility of combining new variables that are not considered in the Altman model. Taken together, the possibilities offered by *trees*, and by the related *rules*, in testing new factors in a *clear, intuitive* and *transparent* way, offer possibilities for unprecedented, data-based and repeatable experiments, all with the possibility of exploring the contribution of each *factor*. We can affirm, with a good dose of initial optimism, that XAI methodologies, just like trees and rules, open up new scenarios for the experimenter in the corporate management field. This preliminary framework shows how XAI can be utilized to help finance professionals, investors, and stakeholders better understand the underlying factors that influence balance sheet performance, risk management, and, more in general, decision-making.

4. Conclusion

XAI as decision tree models can play a significant role in sustainable healthcare management by providing transparent, interpretable, and actionable insights for healthcare professionals. Decision trees are particularly suitable for generating if-then rules, which are easy to understand and can be directly applied in various healthcare management processes. Healthcare professionals can prioritize patients for interventions, improving patient outcomes while using resources more efficiently. Decision trees seem suitable in selecting the most effective and sustainable treatment options for patients based on their specific characteristics, such as age, medical history, and the severity of their condition. This helps healthcare professionals make better-informed decisions, leading to improved patient outcomes and reduced healthcare costs. Decision trees can aid in determining a better allocation of resources, such as medical equipment or hospital beds, based on patient needs and facility constraints. This improves efficiency and ensures that resources are used in the most sustainable manner. Decision trees can help policymakers identify the most effective strategies for improving public health and managing healthcare resources sustainably. This can be based on factors such as demographic trends, disease prevalence, and the availability.

The case study about healthcare management, discussed in Section 3, shows ease of use and speed of the identified heuristics/rules employing a decision tree. A major goal of the experimentation was to reduce the number of attributes used to arrive at the healthcare decisions, which allowed a reduction of costs for services, concerning both diagnostic and clinical tests. As shown in the following, the implementation of a such experimental framework, based on this methodology, allows the delivery of «sustainable rules», that take into account costs, patient satisfaction and impact on the environment, according to the pillars of sustainability.

XAI can be incorporated into balance sheet management using decision trees and if-then rules to provide clear, human-understandable explanations for financial decisions and analysis. Decision trees and if-then rules are particularly suitable for explainability as they break down complex relationships into simple, logical structures that are easy to understand and interpret. For instance, *if-then rules* can be applied to corporate balance sheet management for risk analysis to assess credit risk, liquidity risk, and other financial risks on the balance sheet. XAI based on decision trees seems suitable for financial ratio analysis, because they can help determine the factors driving key balance sheet ratios, such as the debt-to-equity ratio, current ratio, or return on assets. In this case, stakeholders can gain insights into the underlying reasons for a company's financial performance and make informed decisions for improvement. Some other applications of XAI in this field are *anomaly detection*, to identify unusual patterns in financial data that may indicate errors or inefficiencies. Scenario analysis: Decision trees can be employed to analyze various scenarios, such as changes in interest rates, market conditions, or regulatory requirements, and their potential impact on a company's balance sheet. The if-then rules can provide users with a clear understanding of the implications of these scenarios and help them develop appropriate strategies.

Summing up, incorporating XAI with decision trees and if-then rules into corporate balance sheet management can improve transparency and facilitate better decision-making. By providing clear explanations of the factors influencing financial performance, risk, and decision-making, stakeholders can make more informed decisions and implement more effective strategies for managing their balance sheets. The case study presented above represents an encouraging argument in favour of this perspective.

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The Unequal Battle Against Climate Change: Exploring the Effect of Power Distance on the Relationship Between Women on Boards and GHG Emissions

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Abstract

Framing of the research: *The role of women in the board of directors has been a topic of great interest in the literature in recent years. Among others, gender diversity has been investigated as possible driver of corporate environmental commitment.*

Purpose of the paper: *The paper aims at deepening the knowledge on the positive role of women in the board of directors in fostering corporate environmental engagement. In this scheme, a typical cultural parameter has been tested as main moderator, mitigating the beneficial role of women acting as a sort of a brake.*

Methodology: *A panel data regression analysis on Bloomberg500 and S&P500 constituents, yearly observed from 2015 to 2021 has been conducted.*

Results: *Considering, in fact, the Power Distance Hofstede's dimension, the paper explores the role of cultural perception of a precise hierarchy and the impossibility to determine a concrete change, in maintaining latent the potential role of diversity.*

Managerial Implications: *By shedding light on the role of perceived Power Distance, the paper includes in the puzzling debate of corporate governance structure choices and consequences an innovative perspective on the importance of overcoming certain cultural barriers to fully unleash the potential of more diverse boards.*

Originality of the paper: *To the best of our knowledge the paper is among the first to explore the role of power distance in braking the disruptive role of women in fostering climate change commitment.*

Keywords: *Corporate Governance, Women on Board, GHG Emissions, Power Distance, Culture*

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1. Introduction

The role of women in the board of directors has been a topic of great interest in the literature in recent years, dwelling on how gender diversity can drive corporate finance decisions towards different habits and shades of openness. Such topic is embedded in a context in which firms are always more frequently asked to behave in a more socially responsible way, acting more responsibly in order to overturn their negative and depletive impact on the *plethora* of stakeholders in their surrounding environment. Such a consideration has kept gaining momentum, given the great normative attention, by recognizing it as the right thing to do fighting for an unbearable economic system. Among the main call to actions for corporate decision makers, environmental concerns have gained relevance, being nowadays daily discussed to an institutional level, calling for an active engagement fighting for planet safeguard to acquire awareness of the irreparable damages deriving from climate change.

Many scholars, in recent literature, have explored the factors behind corporate strategical decisions, enhancing their socially responsible commitment. Among the others, corporate governance features have caught the interest of the literature, in particular, dwelling on the role of women driving corporate strategies when included in corporate boards of directors. In detail, the role of women in fostering environmentally-friendly practices has been dwelled on (He and Jiang, 2019; Elmagrhi *et al.*, 2019; Burkhardt *et al.*, 2020; García Martín and Herrero, 2020; Atif *et al.*, 2021; Gull *et al.*, 2022), pointing out how women are generally perceived as more careful about environmental issues (Liu, 2018).

Despite such a beneficial role, some key challenges are daily faced by women in the society and, in particular, in corporate boards of directors, namely the enduring resistance towards gender diversity, as well as an unequal distribution of power within certain organizations. Such a kind of cultural biases are part of the scheme of analysis of Hofstede's studies, namely considering it in the Power Distance dimension, which refers to "*the degree to which the less powerful members of a society accept and expect that power is distributed unequally*"¹. As it emerges clearly, this specific cultural dimension can shed a significant role, determining different culturally related attitudes towards gender diversity, specifically in the workplace and among firms. In other words, the established tendency to accept hierarchical orders might reflect in a male-dominated corporate culture, in countries marked by higher scores of Power Distance.

By an empirical analysis on the European and US firms belonging to the Bloomberg500 and S&P500 indices, spanning from 2015 to 2021, to capture the great interest towards environmental engagement from the Paris agreement ongoing, the paper aims at observing the role of women in the board of directors and corporate environmental engagement, reducing GHG Emissions at firm level.

In this scheme, the mitigating role of a typical cultural aspect such as Power Distance is explored, to assess if the cultural perception of hierarchy implies a partial brake of the role of women. Testing the relationship by a robust Panel data regression model, the paper assesses how the benefits of including women in the high level management, in terms of stronger environmental engagement, are partially braked by the perception of a precise hierarchy and the impossibility to determine a change in such scheme of thought.

By shedding light on the damaging role of perceived Power Distance, the paper aims at providing insights for both firms and institutions to promote a more inclusive corporate culture, permitting firms to take fully advantage of the benefits that women can have in fostering corporate environmental commitment.

The remainder of the paper continues as follows: the Literature Review & Hypotheses Development section presents the main strands of the literature on the topics of analysis, getting to the research questions under study; the Data & Methodology section presents the source of data, the sampling strategy and the empirical specification of the model; the Results and Discussion section

¹ <https://hi.hofstede-insights.com/national-culture>

introduces the main outcomes of the analysis, discussing on the main implication; the Conclusion section draws out the main conclusions, implications and possible limitations of the analysis.

2. Literature Review & Hypotheses Development

Climate change concerns, today, are emerging as relevant, also due to the increasing rate of occurrence of catastrophic events such as natural disasters. In this light, the political agenda by governments and international organizations has oriented to overturn the environmental footprint of our economic system, driving firms to more conscious choices. In this path, for example, the UN 2030 Agenda for Sustainable Development has concretized in some clear Sustainable Development Goals (SDGs), first adopted in 2015 by the United Nations. Among the various actors affected by these increasingly relevant issues, firms are asked to reduce their negative footprint, standing actively towards the reach of an eco-efficient and eco-effective (Dyllick and Hockerts, 2002) production system. Given what has been said, such topics have gained relevance in the last few years, not only in practitioners' choices, but mostly in the academic debate, dealing with environmental issues affecting corporate choices.

In the last decade, the academic research on corporate environmental stance has tried hard to dwell on the “*Does it pay to be green?*” question, exploring the virtuous vortex between financial and environmental performance. In this path, several contributions have fed the idea of a positive association between corporate social and financial performances (Hart and Ahuja, 1996; Klassen and McLaughlin, 1996; Russo and Fouts, 1997; Dowell *et al.*, 2000; King and Lenox, 2001; Konar and Cohen, 2001; Dixon-Fowler *et al.*, 2013; Endrikat *et al.*, 2014; Busch and Friede, 2018; Horváthová, 2012; Mironshnychenko *et al.*, 2017). Given the relevance of climate change related issues, scholars have moved their attention to the investigation of integrating environmental issues into corporate decisions, highlighting the relevance of environmentally-related concerns into corporate life, affecting not only financial performances, but also and mostly reputation, capital budgeting and the cost of capital (Sharfman and Fernando, 2008; Gupta, 2018; El Ghouli *et al.*, 2018; Lemma *et al.*, 2019; Caragnano *et al.*, 2020; Russo *et al.*, 2021; Mariani *et al.*, 2021).

Therefore, environmental issues have become a key element to be taken into account when making decisions, to develop strategies according to the relevance of the non-negligible implications for companies underestimating such call to action.

In this sense, the academic debate has explored the possible impact of non-financial characteristics, as those related to corporate governance mechanisms, on environmentally-related corporate policies. Among all, in the last few years, researchers have focused on the role of women among decision makers in strategic roles, fostering environmentally virtuous practices (Zhang *et al.*, 2021).

The presence of women among the firms decision makers has been observed under different theoretical lenses, in particular filtering it by the Upper Echelons perspective, dating back to the original attempts by Child (1972) and Hambrick and Mason (1984). All in all, the Upper Echelons Theory refers to the idea of firms being the reflection of those who drive its choices. In other words, according to the Upper Echelons Theory, decision making processes are the result of *stimuli* determined and shaped by those in charge of the choices themselves. In this context, women would help corporate decision making processes by filtering choices throughout a more risk averse approach to decision making,² and higher social responsibility (Liu, 2018).

Bassyouny *et al.* (2020) demonstrated how UK CEOs disclosure is affected by personal traits, determining different tones of disclosure. In this light, Atif *et al.* (2021) observe how including women in the board of directors drives the more consistent adoption of renewable energies to a firm level, until reaching a “critical mass”. Similarly, Cambrea *et al.* (2023) underline the role of a critical mass of women among the directors in a sample of 2003-2019 firms listed on the Italian

² <https://www.forbes.com/sites/kimelsesser/2022/04/29/women-arent-risk-averse-they-just-face-consequences-when-they-take-risks/>

MTA (Mercato Telematico Azionario), observing how gender diversity fosters ESG performance. The authors claim that this is particularly true in case of women appointed as executive directors. In fact, they recall the urgency of a substantial role to unleash their beneficial effect in fostering ESG engagement.

As it emerges clearly, corporate gender diversity can be tied to a strategic view and must concretely impact on the organizational structure to unleash its effective potential. The subjective aspect of including women in the board of directors is crucial, and Kassinis *et al.* (2016) trace out how including women in the strategic process of decision making sheds an impact on environmentally proactive practices, which is countered by the presence of an excessive number of women. In this sense, the authors are among the first approaching the topic underlining how gender diversity must not be a matter of mere quotas, but a concrete stimulus, instead, fostering socially responsible engagement (Birindelli *et al.*, 2019).

In line with the above literature, the research aims at verifying, to a first extent, if the presence of women among the board of directors is tied to a virtuous and ameliorated corporate environmental commitment.

HPI: The presence of women in the board of directors implies a reduction of GHG Emissions.

As recently stated by the IMF, many women included in the CO26 works complain about the “challenges and risks they face on a daily basis” as women in their countries, and that they suffer from “reduced access to education and employment opportunities—it only deepens existing vulnerabilities and encourages new types of exclusion”³. In this sense, the IMF complains about a still great discrimination, sociocultural barriers, and inequalities in several countries, to a different extent, enhancing vulnerability of women and reducing the beneficial impact of gender diversity.

Hofstede (2004) draws light on the unique traditions of each different country in the world, maintaining and accepting in their archetypical institutions such as families, schools, governments etc., the differences embedded in their national cultures, intended as “software of the mind” (Hofstede and Hofstede, 2005). In detail, Hofstede refers to the complex pattern of thinking, feeling and acting, which makes each country different from the other.

All in all, what emerges is that the values and organizational structure of firms to a country level context are the reflection of the national culture in which they are embedded (Hofstede, 1991), as well as of the complex set of structures and institutional norms (Meyer and Rowan, 1977) dominating each society. In detail, the institutional norms are connected to the set of shared beliefs embedded in the shared culture of each society. As an example, Velayuntham and Perera (2004) points out how guilt emotions spread more commonly in individualistic countries, marked by reduced power distance, driving stronger accountability, without hiding or any form of disclosure, which, on the other hand, is typical of shame prone cultures, privileging conservatism and secrecy.

Among the others, the Hofstede’s model of national cultures has been the object of several studies connected to corporate governance, trying to understand the impact of Hofstede’s dimension on corporate choices. Referring to the most known dimensions, Hofstede (1984) determines six main dimensions of cultural differences, referring to existing divergencies between the cultures of workers from IBM coming from 70 countries. In detail, the author highlights the existence of differences in terms of⁴ Power Distance (PDI), namely “the degree to which the less powerful members of a society accept and expect that power is distributed unequally”. The dimensions of Hofstede have captured the interest of the literature during time, representing a point of reference in cultural studies applied to organizations and firms choices (Agyei-Mensah and Buerter, 2018; Adnan *et al.*, 2018). Among the others, national culture by Hofstede’s dimensions has been adopted by Humphries and Whelan (2017) as a driver influencing corporate governance practices (Li and Harrison, 2008), as recommended by each country-specific corporate governance code. In detail, four of the dimensions (PDI, IDV, MAS, UAI) are tested and found to be related to corporate

³ <https://www.imf.org/en/Publications/fandd/issues/2021/09/advancing-gender-equality-through-climate-action-COP26-trevelyan>

⁴ The definitions of the dimensions are retrieved from the Hofstede’s project website, available at <https://hi.hofstede-insights.com/national-culture>

governance structure, with in detail the gender diversity among the board of directors being strongly influenced by power distance, masculinity and uncertainty avoidance.

Cultural aspects have been adopted by the literature as possible exogenous factors moderating the impact of good corporate governance habits on corporate choices. Going more into detail with the role of power distance, Boateng *et al.* (2020) dwell on the role of power distance, moderating the relationship between higher corporate governance quality and corruption at country level, exploring a sample of 149 countries. In detail, Sue-Chan and Ong (2002) aims at analysing the impact of power distance and, by applying a hierarchical regression analyses, points how that power distance moderates the relation existing between organizational members goal assignment, goal commitment, self-efficacy and performance. In this sense the study introduces the concept of scarce self-efficacy perception.

All in all, thus, the present research aims at testing one typical cultural parameter, namely the Power Distance dimension of Hofstede's six dimensions, to explore if perceiving the difficulty to strive to overturn established hierarchies and less disruptive possibilities, women are constrained by the culture they are embedded in. In detail, the paper aims at moderating the positive role of women on the board of directors in mitigating climate exposure engagement. In detail, the second hypothesis of the study is as follows:

HP2: The cultural degree of Power Distance mitigates the beneficial effect of women in the board of directors on GHG Emissions.

In other words, the study aims at going beyond the well debated positive impact of including women in the board of directors, participating to the strategic process, assessing the effect of corporate culture in shaping the perception of women's role, reducing the potential positive environmental impact unleashed by a more diverse governance structure.

3. Data & Methodology

The analysis is based on the constituents of S&P500 and BE500 Indices, retrieved from the Bloomberg database. In detail, the two indices are representative of US and European firms, with the latter representing a sort of European attempt to replicate the S&P500 Index. In detail, it gathers the best European firms in terms of their market capitalization. All in all, the sample consists of 1003 constituents.

Yearly data spanning from 2015 to 2021 has been adopted, moving from 2015 (Paris Agreement⁵) comprehending the years of raising attention by firms and regulators on firms environmental stance and corporate social engagement.

Table 1 traces out the percentage of firms in the sample. As it is evident, US constituents dominate, representing around 50% of the sample. Immediately after, UK firms represent the 11% of the sample of analysis, while Europe is marked by an adequate heterogeneity, with almost all countries being represented. In this sense, the most represented countries among European constituents are Germany, France, Sweden, followed by Netherlands and Italy.

⁵ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

Table 1 Country Distribution

Country	% of Constituents
Austria	0.6979%
Belgium	0.9970%
Denmark	1.5952%
Finland	1.3958%
France	6.1815%
Germany	6.8794%
Greece	0.2991%
Ireland	0.5982%
Italy	3.3898%
Netherlands	3.0907%
Norway	1.6949%
Portugal	0.3988%
Spain	2.5922%
Sweden	5.7827%
Switzerland	2.8913%
United Kingdom	11.3659%
US	50.1496%
Total	100%

Source: Authors' Elaboration

All in all, the sample is marked by an adequate country heterogeneity, which justifies the analysis based on cultural aspects differing among countries.

In order to conduct the regression analysis, some variables have been computed taking advantage of the data from Bloomberg.

Concerning the main dependent variable of the analysis, in order to take into account the environmental stance of firms in the sample, the relative value of GHG Emissions has been computed. Following the literature (Russo *et al.*, 2021), GHG relative emissions have been measured as the ratio between the total amount of Scope 1,2 and 3 emissions and the Total Sales ratio of each firm.

As main independent variable, in order to consider the role of women presence in the board of directors of the firms, the ratio of Women on Board has been retrieved (He and Jiang, 2019; Nuber *et al.*, 2020; Zhang *et al.*, 2021; Tingbani *et al.*, 2020).

As main moderator, moving from the Hofstede's dimensions, the Power Distance (PDI) of each country has been computed, looking for the relevance of a stronger perception of an existing hierarchical order determining everybody being marked by a specific place which impedes any change to the *status quo*.

At last, dealing with the main control variables, the following have been adopted: the Weighted Average Cost of Capital (Wacc) has been adopted as a measure of indebtedness and capital structure risk by firms; the Return on Assets (ROA) has been referred to as main measure of profitability; the Size of the firms has been computed as the natural logarithm of Total Assets, measuring for their dimensionality; the Quick Ratio has been referred to as a measure of liquidity; at last, the Independent Ratio, as the percentage of independent directors in the board of directors has been adopted. In addition, given the panel structure and the heterogeneity in the sample, Country and Time dummies have been included in the model as specific effects.

All the variables have been included in the model in their lagged version, to avoid any endogeneity concern. All in all, the regression model is the following:

$$GHG\ Sales_{i,t} = \beta_0 + \beta_1 Women\ on\ Board_{i,t} + \beta_2 PDI_{i,t} + \beta_3 Women\ on\ Board * PDI_{i,t} + \beta_4 Wacc_{i,t-1} + \beta_5 ROA_{i,t-1} + \beta_6 Size_{i,t-1} + \beta_7 Quick\ Ratio_{i,t-1} + \beta_8 Independent\ Ratio_{i,t-1} + Time\ Effects + Country\ Effects + \varepsilon_{i,t};$$

After testing the errors for heteroskedasticity and autocorrelation, with the panel version of Breusch-Pagan and Durbin Watson tests, Arellano robust standard errors have been included to ensure the reliability of the estimates. In addition, given the time invariant characteristics of the

Table 3 Regression model moderation analysis
 $y = GHG/Sales$

Variables	Hypothesis	Coefficient	Standard error	t-value
<i>Women on Board</i>	H1	-1.4678**	0.2809	-5.2252
<i>Women on Board*PDI</i>	H2	0.0240*	0.0112	2.1536
<i>Pdi</i>		-0.0082.	0.0048	-1.7184
<i>Wacc</i>		-0.0099**	0.0037	-2.6885
<i>ROA</i>		-0.00532***	0.0015	-3.5915
<i>Size</i>		-0.0128	0.0093	--1.3724
<i>Quick</i>		-0.0096	0.0147	-0.6535
<i>Independent Ratio</i>		0.36905***	0.0854	4.3215
<i>Country Dummies</i>		Yes		
<i>Time Dummies</i>		Yes		
N. of obs.		858		
Adjusted R ²		0.4055		
Prob > F		0.0000		
Arellano robust std.error		Yes		

Notes: p-values(0, 0.001, 0.01, 0.05, 0.1, 1) <=> symbols(“***”, “**”, “*”, “.”, “ “)

Source: Authors' Elaboration

Table 2 records the results of the regression analysis conducted. The presence of women in the board of directors is associated to lower values of relative GHG Emissions, supporting hypothesis 1. Concerning the power distance value, this is barely significant, slightly diminishing the value of GHG relative emissions over sales. Intriguingly, and in line with the second hypothesis of the study, an increasing value of power distance positively moderates the relationship between Women on Board and GHG/Sales. In detail, if including a percentage of women in the board of directors implies a -1.4678 reduction in GHG/Sales ratio, in contexts of higher Power distance the marginal effect is reduced and the overall effect diminishes to -1.4438, because of power distance. In other words, including women among corporate high level directors in countries marked by higher power distance partially brakes the positive role of women in fostering corporate environmental commitment, representing a damaging contextual factor. All in all, in fact, the presence of women in country with higher perceived power distance, namely the perception of being doomed to fail face to established hierarchical orders, impedes women to fully unleash their positive role in mitigating firms damaging environmental habits.

Dealing with the main control variables, the higher cost of indebtedness diminishes the value of emissions, in line with the main findings of the literature according to which higher carbon exposure is tied to higher cost of debt and capital. In addition, higher profitability and ROA mirrors in diminished relative emissions, in a path to a more efficient productive system.

The reliability of the analysis is ensured by the value of the Adjusted R-Squared (0.4055), signalling a good fit of data to the model. In addition, the p-value of the F-statistic both imply a reliable model.

To further ensure the results of the analysis, as a robustness check the same analysis has been conducted substituting the dependent variable, namely GHG relative emissions, by the natural logarithm of Scope 1, 2 and 3 emissions.

Table 4 Robustness check
 $y = \ln GHG$

Variables	Hypothesis	Coefficient	Standard error	t-value
<i>Women on Board</i>	H1	-4.51041***	0.2809	-5.2252
<i>Women on Board*PDI</i>	H2	0.0583.	0.0323	1.8037
<i>Pdi</i>		-0.0122	0.0149	-0.8190
<i>Wacc</i>		-0.0641***	0.0134	-4.7802
<i>ROA</i>		-0.0396***	0.0048	-8.1856
<i>Size</i>		0.8275***	0.0227	36.5201
<i>Quick</i>		0.2459***	0.0409	6.0174
<i>Independent Ratio</i>		0.6336**	0.2147	2.9513
<i>Country Dummies</i>		Yes		
<i>Time Dummies</i>		Yes		
N. of obs.		858		
Adjusted R ²		0.3184		
Prob > F		0.0000		
Arellano robust std.error		Yes		

Notes: *p*-values(0, 0.001, 0.01, 0.05, 0.1, 1) <=> symbols(“***”, “**”, “*”, “.”, “ “)

Source: Authors' Elaboration

Table 4 records the results of the robustness model applied, which maintain the same direction and significance dealing with the main relationships. In fact, power distance positively moderates the negative and significant relationship connecting women in the board of directors and corporate depletive habits, represented by GHG Emissions. Also in this case, the value of the Adjusted R-Squared and the F-Statistic confirm the reliability of the analysis.

The results of the models confirm the hypothesis of the study and convey a message of positive stance of firms marked by the presence of higher shares of women in their boards of directors. However, such relationship is mitigated by the level of perceived power distance connected to the culture of belonging of each constituent, being those countries in which a stronger perception of power distance exists, branded by a braked role of women in firms strategic processes, not able to fully unleash their positive effect which remains latent. In other words, the impact of women is strictly connected to the perception they have of changes being determined by their choices, as well as by their perception of hierarchy and disruptive initiatives. What the findings of the study confirm is that all in all, when women perceive they can have a role and determine a change, they exert a more consistent and environmentally material role, being able to implant virtuous corporate practices in their firms.

5. Conclusions

Today more than ever firms are called to implement effective strategies aimed at reducing their negative environmental footprint, seeking a more sustainable evolution being not only mere compliant to the normative pressures, but mostly ethically aware of the consequences of their production systems.

Among the other determinants of such a virtuous engagement, the prominent role of gender diverse boards shaping more environmentally oriented practices has been a topic of great interest in the literature. Scholars among various topics have struggled to identify how gender diversity can drive corporate finance decisions towards different habits, acting more responsibly towards a new emerging *plethora* of stakeholders in their surrounding environment. All in all, so far, women involved in the strategic processes have been pointed out as more careful about environmental issues (Liu, 2018).

Despite a general consensus on such a beneficial role, some key challenges are daily faced by women in their society as a whole and, as a micro-reflection, in organizational boards. An enduring resistance towards gender diversity is part of our everyday discourses, marked by an unequally perceived distribution of power within organizations. Such a kind of cultural biases can be traced out in the seminal works by the pioneers of organizational culture studies, among which Hofstede and his studies emerge.

Thus, by an empirical panel data regression analysis on the European and US constituents belonging to the Bloomberg500 and S&P500 indices, spanning from 2015 to 2021, the paper aims at observing the role of women in the board of directors and the effect of such feature on corporate environmental engagement. In this scheme, a typical cultural model has been tested as moderator, mitigating such a beneficial role acting as a sort of a brake. Considering, in fact, the Power Distance dimension, which refers to “*the degree to which the less powerful members of a society accept and expect that power is distributed unequally*”⁶, the paper has assessed how the benefits of including women in the high level management on stronger environmental engagement, confirmed by the analysis, are partially braked by the cultural perception of a precise hierarchy and the impossibility to determine a change in such scheme of thought.

By shedding light on such damaging role of perceived Power Distance, the paper aims at including in the puzzling debate of firms corporate governance structure choices and consequences, an innovative perspective, assessing the importance of overcoming certain cultural barriers to fully unleash the potential of more diverse boards. The paper clearly represents a call to action to firms, but mostly to institutions, struggling to promote a more inclusive corporate culture and permitting firms to take complete advantage of the latent benefits that women can have in fostering corporate environmental commitment.

Dealing with the main limitations of the analysis, this last lies on a sample marked by a stronger presence of US constituents. In this sense, future research can explore several countries including also Asian and African firms, to frame the phenomenon in a globally built perspective.

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⁶ <https://hi.hofstede-insights.com/national-culture>

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