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**Leveraging intersections
in management theory and practice**

Selected papers from Sinergie-SIMA 2021 Conference
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1. *May your choices reflect your hopes, not your fears.*
(Nelson Mandela)
2. *Change is never painful. Only the resistance to change is painful.*
(Buddha)
3. *Beginnings have inexpressible charm.*
(Molière)
4. *Just because I'm losing, doesn't mean I'm lost.*
(Coldplay)
5. *There is something more important than logic: imagination.*
(Alfred Hitchcock)

Leveraging intersections in management research and practice

Arabella Mocciaro Li Destri
Leveraging intersections in
management research and
practice

Arabella Mocciaro Li Destri

This issue of the *Sinergie - Italian Journal of Management* contains the best papers presented at the Sinergie-SIMA 2021 Annual Conference titled “Leveraging Intersections in Management Research and Practice”, which was organized by the University of Palermo and took place online on June 10-11, 2021. The Conference was held online due to the ensuing conditions of the Covid-19 pandemic at the time. Though in 2021 the digital format imposed by the global sanitary conditions had a strong impact on the participation rates of many of the major international conferences, this meeting was largely participated, with around 350 participants, 52 full papers and 114 extended abstracts presented, and offered a rich and profound perspective of investigation on issues directly connected to the conference theme. A paper development workshop organized the day before the conference to help younger scholars progress in their studies also gathered significant traction and engaged participation.

The theme of the meeting is connected conceptually to the Sinergie-SIMA conferences of the years that preceded it: “Management and Sustainability. Creating Shared Value in the Digital Era” hosted by Sapienza University of Rome in June 2019, and “Grand Challenges: Companies and Universities together for a Better Society” hosted conjointly by the Sant’Anna School of Advanced Studies and the University of Pisa in June 2020. In different ways, these conferences have brought our community to engage in research concerning phenomena that represent major societal and economic challenges. The conference held in Palermo complements and embraces in several ways the themes of the conferences previously held in Rome and Pisa, as it attracts attention to the disciplinary, theoretical and methodological framing of research that is able to effectively tackle the societal phenomena discussed in the prior conferences.

As management scholars, we are aware that the legitimacy of our community and profession in society increasingly rests on our ability to generate social and economic value by finding solutions and offering effective and timely guidance to leaders in firms and institutions (Currie *et al.*, 2016; Tihanyi, 2021). This is especially true in face of the extraordinary economic, societal, health and environmental challenges firms, communities and governments are currently tackling worldwide, also as a consequence of the COVID-19 pandemic (Muzio and Doh, 2020) and, more recently, of other disruptive dynamics generated in our economic and social context by the war between Russia and Ukraine.

In parallel, management practitioners are increasingly urged to adopt wide-ranging strategies to pursue a multidimensional notion of firm performance (Kotlar *et al.*, 2018); a concept that extends beyond technical

and economic dimensions to embrace a larger set of issues, such as sustainability and societal impact.

Challenges such as these are far too complex to be captured by only a single perspective. In order to shed light on the multifaceted phenomena that underlie firm performance and societal advancement, research is spurred to knowledgeably compare and leverage contributions that derive from adopting different disciplinary, theoretical and methodological perspectives (Eisenhardt *et al.*, 2016; George *et al.*, 2016), as well as by considering different levels of analysis. Furthermore, there is the fundamental need to orient such scholarly enquiry to concerns of immediate interest for the world of practice.

Anchoring research questions to real-world phenomena allows to appreciate and grasp their multiple dimensions and manifestations. Conscious pluralism and the intentional comparison of the relative contributions offered by different disciplines, theories, methods and levels of analysis offer a way forward for the comprehension of relevant phenomena for management scholars. Though challenging, there is relevant potential to generate sound and impactful research by purposefully leveraging *intersections* between different perspectives in the field of management to study phenomena of interest also to practitioners.

This general invitation has been answered in a variety of ways by the papers collected in this special issue that includes the research selected and awarded by the conferences' scientific committee. All the studies published, independent from their empirical or conceptual nature, make clear research based contributions not only to extant theory in the field of management, but also to practitioners and, at times, also to policy makers. Amongst the major societal challenges faced today, the research contained in this volume contributes mainly to knowledge regards sustainability, globalization, diversity and the effects of the digital revolution. The intersection between different dimensions related to sustainability and circular economy is at the center of the studies offered by both Formisano *et al.* (2022) and Corsini *et al.* (2022), however the level of analysis they focus on and the research methods they deploy differ. The former study contributes to shed light on the way the characteristics connected to smart sustainable cities and circular economy are interconnected with reference to EU cities, suggesting the relevance of adopting a holistic concept in future policy making and city management due to the high degree of mutual influence between the two concepts. The latter focuses on the cognitive frameworks that must be developed in order to carry out a successful transition towards a circular economy model in the HORECA and hospitality industries, underlying the necessity to develop an integrative view of economic and environmental logics and the challenges this transition poses.

A second set of studies in this volume considers corporate sustainability and diversity. Here too, the focus and research methods diverge, whilst the level of analysis in both cases is the firm. In particular, Conte *et al.* (2022) consider social inclusion of disabled users and offer a study that assesses the degree to which corporations are actually enhancing their sustainability by applying international guidelines regards the accessibility of their websites, whilst Ciasullo *et al.* (2022) leverage upper echelon theory to analyze the

relationship between environmental sustainability and green innovation ambidexterity and, the moderating role of women in corporate boards in moderating this relationship.

The challenges connected to diversity are also central to the study of De Masi *et al.* (2022) and Asi *et al.* (2022). The research proposed by De Masi *et al.* (2022) also contributes to the understanding of the role of gender diversity in corporate board decision-making processes, offering an empirical study of the threshold levels of female director presence in corporate boards that trigger the voicing of women's opinions and those that influence the degree to which women voices are heard, also suggesting practical implications for gender quota regulation. Spiritual diversity is central, instead, in the study offered in this volume by Asi *et al.* (2022), in which studies regarding spirituality and values are leveraged to analyze the role of these dimensions in the setting of succession processes in family firms.

The role of leveraging theories to shed light on societal challenges, by using them in original ways to interpret and analyze phenomena that are different from mainstream extant studies and by shifting levels of analysis, characterizes the contributions offered to this volume by Moi *et al.* (2022) and of Martzanis and Hagen (2022). In their study, Moi *et al.* (2022) develop a conceptual framework that considers the evolution of SME strategies in times of crisis from a novel perspective by shifting attention from extant focus on large corporations to small and medium ones pinpointing the specificities of crisis prevention, response and recovery in this setting. Upper echelon theory is used in Matzanis and Hagen (2022) to shed light on the role of entrepreneurial experience for venture internationalization shifting the level of analysis from the individual to the entrepreneurial team.

Globalization and its consequences are central also in the work of Marozzo *et al.* (2022) that offers an empirical study on the relevance of authenticity and traceability of products on the willingness to pay of consumers in a specific agri-food business. Consumer behavior in the light of a major societal challenge is at the center also of the study carried out by Zerbini *et al.* (2022) that digs into consumer behavior and m-commerce in the light of the current digital revolution.

Overall, the portfolio of research published in this special issue offers a multifaceted and intriguing set of stimuli for further studies positioned at the intersection of management theory and practice which we look forward to reading in the future.

The number and quality of contributions received in occasion of the conference, and the identification of the selected and best papers owes tribute to the precious work of many colleagues. Amongst these, particular gratitude goes to the extremely thorough support of the scientific committee of the conference, to my outstanding conference co-chairs - Marta Ugolini and Sandro Castaldo - who have provided exemplar leadership and have built a vibrant and engaged community of Italian management scholars, eager to contribute to this conference notwithstanding the challenges posed by the pandemic. Finally, I'd like to especially thank the local organizing committee - Carlo Amenta, Paolo Di Betta, Gabriella Levanti, Massimo

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Best papers

Investigating the importance of product traceability in the relationship between product authenticity and consumer willingness to pay¹

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Veronica Marozzo - Alfonso Vargas-Sánchez - Tindara Abbate
Augusto D'Amico

Abstract

Research framework: The effects of agricultural market globalization have increased the perception of inauthentic products; therefore, consumers increasingly search for real and genuine products. Product authenticity, generally defined with terms such as real, original, unique, genuine, and traditional, is becoming a frequent evaluation criterion that guides consumer decision-making. In this perspective, the traceability of the product could play a relevant role by allowing consumers to know more about the product (i.e., the whole process), which leads to greater trust in it.

Purpose of the paper: This study explores the importance of product traceability in the relationship between product authenticity and consumer willingness to pay (WTP) for agri-food products, specifically for organic olive oil. Traceability is seen as a crucial factor in the agri-food sector, by preventing deliberate or accidental mislabeling (i.e., adulterations, fraud, scandals).

Methodology: Quantitative data were collected from a convenience sample of consumers through an online survey built on the Qualtrics software platform. The survey was performed in Spain, considered the first and most important producer of organic olive oil in the world.

Findings: The findings provide preliminary evidence that the importance of product traceability plays a mediating role in the relationship between product authenticity and consumer willingness to pay for organic olive oil.

Research limits: This study adopts an exploratory approach and was developed only in the Spanish context. It would be useful to perform the analysis in other relevant olive oil producing countries, such as Italy or Greece. Additionally, the study focused on a specific type of comestible product (i.e., organic olive oil), then to corroborate the validity and generalizability of the findings further research will focus on different edible products.

Practical implications: Findings contribute to the literature on the authenticity construct and allow implications for the marketing of agri-food products to be drawn.

Originality of the paper: Through empirical evidence, this study sheds some light on the under-investigated nature of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay.

Key words: product authenticity; willingness to pay; product traceability; organic olive oil product; Spain.

¹ Acknowledgements. Results of the PON AIM “Research and Innovation 2014-2020”, research project “Attraction and International Mobility”

1. Introduction

Currently, the number of consumers involved in food safety (Röhr *et al.*, 2005; Grunert, 2005) and health products (Maddock *et al.*, 1999; Olsen, 2003) is continuously increasing. However, the effects of the globalization of agricultural markets imply that consumers come into contact with an endless variety of foods. Nevertheless, if, on the one hand, food market globalization provides the consumer with accessibility to non-native products, on the other hand, it has increased the perception of inauthentic products (Smiechowska and Klobukowski, 2015). Therefore, consumers begin to search for “something real from someone genuine” (Gilmore and Pine, 2007, p. 1) by demanding information and reassurances about the origin and content of food products (Carcea *et al.*, 2009). Specifically, recent trends are showing a greater sensitivity towards the origin of food products and their authenticity, observed as criteria of evaluation and decision-making that guide consumer choices (Liao and Ma, 2009). Previous research underlines that authenticity attributes have a positive and statistically significant impact on consumer interpretations, behavioral responses, and interest, such as willingness to pay (Lehman *et al.*, 2019). It has shown that consumers tend to be willing to pay more for products they consider authentic (e.g., Fuchs *et al.*, 2015; Smith *et al.*, 2016). O'Connor *et al.* (2017), found that authenticity cues increase purchase intentions and willingness to pay. By exploring a set of four distinct meanings of authenticity (i.e., moral, type, craft, and idiosyncratic), the existing literature has underlined that most consumers express a willingness to pay more for each authenticity type.

In terms of reassurances on the origin and content of food products, traceability is observed as a crucial factor for the agri-food sector (Papetti *et al.*, 2012; Costa *et al.*, 2013). Food traceability implies the control of the whole chain of food production and marketing, by allowing the food to be tracked through each step of its production back to its origin (Ampatzidis and Vougioukas, 2009). Indeed, with the objective of ensuring public health, it is a necessary tool for the prevention of deliberate or accidental mislabeling, such as food adulterations, fraud, and scandals (Charlebois and Haratifar, 2015). In this respect, very emblematic cases might be the Melamine milk powder scandal in China in 2008 (Xiu and Klein, 2010), the dioxin contamination of chicken feed in Belgium in 1999 (Bernard *et al.*, 2002), and bovine spongiform encephalopathy. To face these problems, various regulations, at national and international levels, have been defined with the objectives of providing the basis for the assurance of high-level protection of human health, and the safety and quality of food products (i.e., Charlebois *et al.*, 2014). Additionally, these incidents draw consumer attention to food safety and integrity, which increases consumer awareness of a food product, by pressure on public/private organizations to implement traceability in their food supply chain (Haleem *et al.*, 2019) in order to provide easy access to the history of the products (Olsen and Borit, 2013) and information regarding the source of raw materials, process, application, and location of products. Effectively, this increases consumer confidence (Kher *et al.*, 2010) and creates connections between

producers and consumers (Regattieri *et al.*, 2007). Concerning the case of organic olive oil products, the increasing demand for high-quality olive oil, which might be adulterated with other low-quality oil, and the safety within the food chain, has led to greater attention to the traceability of product characteristics (i.e., nutritional), production and transformation methods, to effectively improve food safety and quality and to limit the risk of adulteration and fraud (Zhang *et al.*, 2012).

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Although previous scientific contributions have investigated the relationship between food product authenticity and consumer willingness to pay (WTP) (Sidali and Hemmerling, 2014; O'Connor *et al.*, 2017; Kendall *et al.*, 2019), little analysis has been conducted to examine the importance of product traceability of this above-mentioned relationship. Therefore, in order to fill this gap, the focus of this paper is to investigate the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, shedding some light, through empirical evidence, on the under-investigated nature of the traceability.

To achieve this research objective, an explorative approach is adopted, and the organic olive oil product is selected because the question linked to the authenticity and traceability of this product represents a challenging task due to the complexity of deliberate fraudulent adulterations and practices (Meenu *et al.*, 2019). The study is conducted in Spain considering that this country is the first and most important producer of organic olive oil in the world².

This research contributes to the previous studies on food authenticity, highlighting insights into the relationships between this construct and consumer willingness to pay. Specifically, by theoretically positioning and empirically substantiating, this study underlines that traceability assumes a mediating role in the relationship between product authenticity and consumer willingness to pay for organic olive oil, and advances the existing literature focused mainly on the authenticity construct, its characteristics, and its relationships.

The paper is organized as follows. The following section reviews the existing research contributions on the authenticity construct, with particular focus on the effects of authenticity in the domain of food products and its connections with traceability and willingness to pay. Then, it is followed by a description of the research design and methodology used. Findings and discussions are presented. Finally, the theoretical and managerial implications, limitations, and future research proposals are highlighted.

2. Theoretical background

Authenticity is an important topic within marketing literature, even if it is a very elusive concept that has multiple meanings with both demand and supply connotations. The term 'authenticity' remains problematic because

² Spain is the biggest producer of olive oil in the European Union: from 2015/16 to 2017/18, on average, it accounted for 63% of the entire EU production (source: European Commission, 2020).

what is often seen as authentic is professed arbitrarily (Boyle, 2003). Previous studies have examined authenticity in several consumption contexts, by analyzing tourist sites (Chronis and Hampton, 2008), green products (Miniero *et al.*, 2014), beverages (Del Chiappa *et al.*, 2019) and agri-foodstuff (Chousou and Mattas, 2019). These studies have provided evidence that perceived authenticity influences consumer evaluations (e.g., Beverland and Farrelly, 2010; Sidali and Hemmerling, 2014; Fuchs *et al.*, 2015), by highlighting how consumers may use authenticity cues as risk-relieving strategies in their evaluation processes. In addition, the signals of authenticity could increase consumer awareness of the product and provide reassurance during the selection and purchase processes.

The next sections review existing research on authenticity, assuming a specific focus on the effects of authenticity in the domain of food products and its link with traceability and willingness to pay, which lead us to the definition of our research question.

2.1 Authenticity research

The quest for authenticity is a characteristic of postmodern consumption (Firat and Venkatesh, 1995). In the previous studies within the field of marketing, authenticity is defined as something original, or a realistic copy of the original (Lunardo and Guerinet, 2007). According to Boyle (2003), alternative expressions of authenticity include terms such as ethical, natural, honest, simple, sustainable, and rooted. Moreover, words such as original, genuine, unique, traditional, and real are used by modern consumers to define authenticity (Muñoz *et al.*, 2006). Beverland and Farrelly (2010) have identified a shared meaning of authenticity that is a consumer desire for genuineness, reality, and truth driven by control, connection, and virtue benefits.

From the consumer viewpoint, perceived authenticity refers to consumer beliefs or expectations about a product being genuine, real, and/or true (e.g., Grayson and Martinec, 2004; Beverland and Farrelly, 2010). Grayson (2002) has suggested that consumers interpret authenticity in several different ways, depending on what is being evaluated and under what circumstances. Grayson and Martinec (2004) have explained authenticity as iconic (e.g., when an object is an accurate reproduction of the original), indexical (e.g., when an object has a factual, spatiotemporal connection to history), and hypothetical (e.g., when an object has a hypothetical, spatiotemporal connection to history) typologies in market offerings. According to Grayson and Martinec (2004), indexical and iconic cues are predicted to influence consumer processing of apparent product significance. Moreover, Fejes and Wilson (2013) have suggested that consumers use both extrinsic and intrinsic cues to evaluate authenticity, which serve as a substantial evaluation and decision-making criterion that can guide consumer choices (Liao and Ma, 2009).

2.2 Authenticity, traceability, and willingness to pay in the domain of food products

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As mentioned in the marketing literature, product authenticity has been investigated in several contexts, such as fast food (Beverland and Farrelly, 2010), green or environmentally conscious consumption (Ewing *et al.*, 2012), traditional food specialties (Sidali and Hemmerling, 2014), and handmade products (Fuchs *et al.*, 2015), stressing that perceived authenticity influences consumer evaluations and interest. Several attributes of authenticity have indeed been identified in the existing literature able to influence consumer perceptions of product authenticity. Gilmore and Pine II (2007) define natural authenticity as the people's tendency "*to perceive as authentic that which exists in its natural state in or of the earth, remaining untouched by human hands; not artificial or synthetic*" (p. 49). They refer to growers of organic foods, in forsaking pesticides and fertilizers, as commodities that belong to this kind of authenticity.

The authenticity construct is wide and involves several meanings and dimensions, for instance, the genuineness, origin, or naturalness of the product (van Giesena and de Hoogeb, 2019). Camus (2004) identifies three dimensions, which are origin, projection of the consumer to the product, and uniqueness, capable of encapsulating the concept of product authenticity concerning an agri-foodstuff. Authentic products are often considered local, regional, and/or traditional (Kadirov, 2015), real, sincere, and genuine (Beverland and Farrelly, 2010; Morhart *et al.*, 2015). For specific products, such as fruit and vegetables, the naturalness dimension of authenticity is crucial, underlying respect for the environment, healthiness, and freshness (Binnering, 2017). Uniqueness is another relevant feature of authentic products, contrary to industrial products sold in huge quantities (Groves, 2001). Additionally, foodstuff authenticity regards genuineness, related to the place of production (Sims, 2009), country of origin (Chousou and Mattas, 2019; Bertoli and Resciniti, 2013), product ethnicity (Park *et al.*, 2016), and handmade production processes (Fuchs *et al.*, 2015). According to Groves (2001) and Sims (2009) the authentic product is associated with nutritional value and assurances of high-quality. Sidali and Hemmerling (2014) investigated the object-based authenticity of traditional food, finding a positive impact of quality claims concerned with the temporal, spatial, and product-specific attributes of food specialties, on the intention to consume a food product. Food product authenticity can be communicated through certifications concerning geographical indications and organic production (Spielmann and Charters, 2013), brand name (Groves, 2001), color packaging (Marozzo *et al.*, 2020), and selling price (Fejes and Wilson, 2013).

Previous studies emphasize that food product authenticity can affect consumer willingness to pay, by finding a positive impact of authenticity claims on the intention to consume traditional food products (Sidali and Hemmerling, 2014; Mingione *et al.*, 2020). Authenticity, increasing appeal and value, can positively influence purchase intentions and greater consumer willingness to pay for food products perceived as authentic (O'Connor *et al.*, 2017). In this respect, consumers express willingness

to pay a premium price for food products that better meet authenticity requirements (Kendall *et al.*, 2019). Consumers acknowledge the price premiums associated with the purchase of authentic food products and are willing to accept this expense to ensure the authenticity of products carrying possible health risks and to limit the problems linked to adulteration and fraud.

Regarding the food system, olive oil is one of the main foodstuffs of the Mediterranean area, with a high selling price and a great level of adulteration. So authenticity becomes an evaluation and decision-making criterion that guides specific purchasing choices for olive oil (Chousou *et al.*, 2018). Especially for organic olive oil, consumers are willing to pay an extra price premium; besides, they are aware of the alteration risk and use authenticity cues, as signals during the purchase process, for assessing food products (Yangui *et al.*, 2016). From a research study on Italian consumer preferences for extra virgin olive oil, it emerges there is a very high willingness to pay a premium price for this kind of food product (Piccolo *et al.*, 2013).

Consumer purchasing behavior of organic olive oil is affected by the fact that consumers are typically concerned about health and safety (Tsakiridou *et al.*, 2006) and are increasingly oriented to consider the adoption of traceability systems in the food supply chain (Haleem *et al.*, 2019) in order to have information transparency, to guarantee high-quality, and to limit possible food fraud (Papetti *et al.*, 2012). In particular, consumers demand verifiable evidence of traceability as an important criterion of food quality and safety, by underlining the need for a traceability system that provides information on the origin of foods, characteristics, process methods, retailing and final destination (Bertolini *et al.*, 2006; Aung and Chang, 2014). Therefore, in this perspective, traceability can potentially represent an important “*tool to assist in the assurance of food safety and quality*” (Aung and Chang, 2014, p. 172) when consumers make food-related purchasing decisions, thus preferring food products characterized by information traceability, quality assurance and certification information (Verbeke and Ward, 2006; Hou *et al.*, 2019). Evidence shows that consumers prefer and are willing to pay a premium for food with traceability information (Zhang *et al.*, 2012; Bai *et al.*, 2013) because traceability increases consumer security and confidence (Costa *et al.*, 2013) by ensuring certain processing elements and procedures.

Despite significant attention to the above-mentioned constructs, to the author’s knowledge, there is a lack of empirical evidence on the role of product traceability in the relationship between product authenticity and consumer willingness to pay. Thus, understanding the importance of product traceability is proposed in the following research question:

RQ: What role (moderator or mediator) does the importance of product traceability play in the relationship between product authenticity and consumer willingness to pay?

3. Methodology: research design

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Quantitative data were collected from a sample of the Spanish population with an online survey built on the Qualtrics software platform. The survey was advertised through a convenience sample of websites, blogs, social networks, and emails to reach the widest public. Convenience sampling is a kind of nonrandom sampling in which members of the target population are selected for the purpose of the study if they meet certain practical criteria, such as geographical proximity, availability at a certain time, easy accessibility, or the willingness to volunteer (Dörnyei, 2007). Therefore, considering the context of the investigation (i.e., Spanish organic olive oil consumers), Spanish websites, blogs, online forums, and pages on social networks related to the organic olive oil sector were identified, and thanks to word of mouth it was possible to reach the widest public. Although this survey method was selected for its time and cost advantages over traditional systems, it is opportune to consider that it carries some limitations such as self-selection bias (e.g., Thompson *et al.*, 2003), respondents misrepresenting their age, gender, level of education or other socio-demographic variables (e.g., Dillman, 2011), representativeness (e.g., Couper, 2011), and the possible risk of including multiple responses by the same person (e.g., Konstan *et al.*, 2005).

The Covariance-Based SEM (CB-SEM) requires a sufficient sample size and, given the asymptotic property of the maximum-likelihood (ML) estimation, a minimum sample size is necessary to generate results of sufficient accuracy (Jannoo *et al.*, 2014). According to Hair *et al.*, (2009), a minimum sample size of 100-150 is sufficient for a model with five or less constructs. Out of 292 questionnaires, even if only 191 (65.41% response rate) questionnaires were found correct and valid for the analysis, the sample of the study is much higher than 150 and, therefore, it's possible to conclude that it meets the criteria. Participants' age ranged from under 18 to over 65, with the median category falling into the 35-49year range. About 51% of the respondents were female, 86.1% of the sample had at least a bachelor's degree, and 53.9% were employed. About 67% of respondents had household monthly incomes of less than € 3.000.

The questionnaire was constructed using an adapted 7-point Likert scale, asking participants to indicate the extent to which they agree or disagree (1 = strongly disagree, 7 = strongly agree) with the proposed statements. The concept of product authenticity was captured by an eight-item scale selected from previously established scales (e.g., Beverland and Farrelly, 2010; Fuchs *et al.*, 2015; Park *et al.*, 2016). The dependent variable of the model, that is the willingness to pay for the organic olive oil (WTP), was measured using a three-item scale adopted from Ghali (2020). Finally, the concept of the importance of product traceability was captured by two semantically different items adopted from Verbeke and Ward (2006) by asking "To what extent do you pay attention to the traceability of the product when buying organic olive oil?" (ranging from 1 = very low attention, to 7 = a lot of attention); and "To what extent is the traceability of the product important to you when you buy organic olive oil?" (ranging from 1 = totally unimportant, to 7 = extremely important).

Quantitative methodology was based on a Confirmatory Factor Analysis (CFA) to test the measurement model to ensure the reliability and validity of the constructs. According to Brown (2015), CFA is an indispensable analytic tool to construct validation in social and behavioral sciences by providing evidence about the convergent and discriminant validity of theoretical constructs. Moreover, to explore the role of the importance of product traceability on the relationship between product authenticity and consumer willingness to pay, a moderation and a mediation analysis were conducted (Hayes, 2018). In social sciences, the study of the relations of moderation and mediation is significant from a conceptual and an applicative perspective (Miceli, 2013). Analyzing a conditioned relationship by one or more moderation variables allows the evaluation of the specific conditions under which a causal relationship changes in terms of intensity and/or significance. Analyzing an indirect relationship based on one or more mediation variables allows theorizing and testing the processes or mechanisms that determine a cause-effect relationship (Baron and Kenny, 1986).

4. Findings

Data were entered into IBM SPSS Statistics (version 25, SPSS Inc., Chicago, IL, USA), and data accuracy was checked throughout the process. To address the research question, a Confirmatory Factor Analysis (CFA) of the measurement model was conducted to ensure reliability and validity of the constructs. The overall measurement model with three constructs and 13 observed indicators was estimated through CFA. Estimation methods in Covariance-Based structure analysis are typically developed under an assumption of multivariate normality (e.g., Browne, 1974; Jöreskog, 1969). However, the assumption of normality is usually violated because it cannot be met in most empirical research (Hu *et al.*, 1992; Jannoo *et al.*, 2014), which is also the situation in this research. Some recent simulation studies (e.g., Goodhue *et al.*, 2012; Reinartz *et al.*, 2009) have shown that given non-normality conditions, the Covariance-Based SEM were quite robust. In particular, in the simulation study of Hu *et al.* (1992), the authors have shown that, even in the condition of assumption of multivariate normality violation, the maximum-likelihood (ML) is a robust estimation method. Then, a completely standardized solution produced by the LISREL 8 maximum-likelihood method (Jöreskog and Sörbom, 1993) was conducted by showing that the model-fit indices of the CFA resulted in a good fit: $\chi^2(62) = 123.617$, $p < .001$; $\chi^2/df = 1.994$; GFI = .909; NFI = .961; NNFI = .975; CFI = .980; Standardized RMR = .0482; RMSEA = .0722. Moreover, all estimated factor loadings in the measurement model showed high factor loading coefficients (all loadings $\geq .60$) and significant t-values (all $p < .001$ - see Table 1). Construct validity was examined by assessing convergent and discriminant validity (Fornell and Bookstein, 1982; Ping, 2004). Specifically, the standardized factor loading of all items exceeded all thresholds (all significant at $p < .001$, and the average variance extracted - AVE - was greater than the .50 cut-off) which supports the convergent validity of the measurement scales. According to Ping (2004), to ensure

discriminant validity the squared correlation coefficients between any pair of constructs should be lower than the AVE for each construct. The results have demonstrated that all of the squared correlations between pairs of constructs were lower than the AVE for each construct, therefore, all constructs were considered to be distinctively different, confirming discriminant validity.

Moreover, the three items used to measure the dependent variable (i.e., *willingness to pay*) showed a Cronbach alpha of .90, and item-to-total correlations were larger than .75 for all the items. Therefore, an average score of *willingness to pay* was created. The eight items used to measure the independent variable (i.e., *product authenticity*) showed a Cronbach alpha of .90, and item-to-total correlations were larger than .60 for all items. Therefore, an average score of *product authenticity* was created. Finally, the two items used to measure the intended mediating variable (i.e., the *importance of product traceability*) showed a Cronbach alpha of .79, and item-to-total correlations were larger than .66 for all the items. Thus, the average score of *product traceability importance* was created.

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Tab. 1: Results of confirmatory factor analysis (CFA)

Construct and item	Standardized Loadings	t-values*	CR ^a	AVE ^b
Willingness to pay			.909	.771
I am willing to spend extra money in order to buy organic olive oil	.857	Fixed		
It is acceptable to pay a premium price to purchase organic olive oil	.806	14.009		
Compared to conventional olive oil, I am willing to pay more for organic olive oil	.963	17.630		
Product Authenticity (The organic olive oil:)			.906	.548
is a genuine product	.812	Fixed		
is an original product	.795	12.347		
is a true product (not altered)	.775	11.932		
is a typical product	.695	10.345		
is made in the traditional method	.660	9.709		
is unique of its kind	.813	12.720		
reflects its place of origin	.742	11.269		
is a typical Spanish product	.601	8.660		
Product Traceability Importance			.803	.674
To what extent do you pay attention to the traceability of the product when buying organic olive oil?	.909	Fixed		
To what extent is the traceability of the product important to you when you buy organic olive oil?	.723	6.964		

Notes: Goodness-of-fit indexes: χ^2 (62) = 123.617, $p < .001$; χ^2/df = 1.994; GFI = .909; NFI = .961; NNFI = .975; CFI = .980; Standardized RMR = .0482; RMSEA = .0722. All items were measured on a seven-point Likert scale. ^aConstruct reliability $\geq .70$ (Nunnally, 1978); ^bAverage Variance Extracted $\geq .50$ (Fornell and Larcker, 1981).

* all $p < .001$

Source: Authors' elaboration

In line with the exploratory purpose of this study, a moderation and a mediation analysis were effectively performed (Aguinis *et al.*, 2017; Memon *et al.*, 2018; Memon *et al.*, 2019). A moderation analysis (Hayes, 2018) was conducted to test the importance of product traceability as a potential boundary condition on the relationship between product authenticity and consumer willingness to pay. The model was tested by applying bootstrapping (PROCESS macro - model 1) and the interaction was probed by testing the conditional effects at three levels of product traceability importance, one standard deviation below the mean, at the mean, and one standard deviation above the mean. As shown in Table 2, the interaction between product traceability importance and product authenticity was non-significant ($\beta = -.035, p = .281$). These results provide preliminary evidence that the importance of product traceability is not a moderator of the relationship between product authenticity and consumer willingness to pay for organic olive oil.

Tab. 2: Results of the moderation analysis

Predictor	β	p	95% CI	
PdtTrace	.195	.005	[.059	.329]
PdtAuth*	.514	.000	[.326	.701]
PdtTrace x PdtAuth*	-.035	.281	[-.098	.029]

* $p \leq .05$

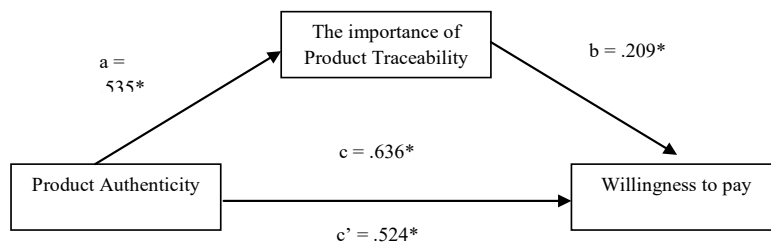
Source: Authors' elaboration

A mediation analysis (Hayes, 2018) was conducted to test the importance of product traceability as the underlying mechanism of the relationship between product authenticity and consumer willingness to pay (product authenticity \rightarrow product traceability importance \rightarrow willingness to pay). The model was tested by applying bootstrapping (PROCESS macro - model 4) to the test of the indirect effect to determine if it is different from zero at the conditional effect at 95 per cent confidence intervals (CI). The analysis is then run on 5000 bootstrap samples to obtain the desired statistic for every one of them, there will be 5000 computed indirect effects. These effects are then placed in ascending order to determine the lower and upper bounds of the CI (Hayes, 2018). The results of a mediation analysis revealed a significant total effect of product authenticity on WTP ($c = .636$; $SE = .073$; $t = 8.706$; $p = .000$); a significant effect of product authenticity on product traceability importance ($a = .535$, $SE = .082$; $t = 6.496$; $p = .000$); a significant effect of product traceability importance on WTP ($b = .209$; $SE = .063$; $t = 3.326$; $p = .001$); and a significant direct effect of product authenticity on WTP ($c' = .524$; $SE = .079$; $t = 6.657$; $p = .000$), when controlling for product traceability importance. The direct effect of product authenticity on WTP was found to be positive and statistically significant (Effect = .52, $p < .000$), also the indirect effect of product authenticity on WTP was found to be positive and statistically significant (Effect = .11, 95% C.I. [.04; .20]). Findings have shown that the indirect effect with a 95% bias-corrected bootstrap confidence interval based on

5000 resamples does not straddle zero, which allows us to conclude that the indirect effect is different from zero. This result indicates a significant indirect effect and provides preliminary evidence that the importance of product traceability partially mediates the effect of product authenticity on consumer willingness to pay. Figure 1 illustrates the results of the mediation analysis.

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Fig. 1: The effect of product authenticity on willingness to pay through the importance of product traceability



Indirect effect = .11, Bootstrap 95% CI = [.04, .20], * $p < .01$

Source: Authors' elaboration

5. Discussion and conclusion

Product authenticity is becoming increasingly relevant in the agri-food context since it influences consumer evaluations, inclinations, and purchase processes (e.g., Beverland and Farrell, 2010; Sidali and Hemmerling, 2014). Product authenticity can affect consumer willingness to pay for food products that consumers perceive as authentic (O'Connor *et al.*, 2017); in particular, they are oriented to pay a premium price for food products that are coherent with authenticity requirements reducing health risks. Additionally, consumers rely on traceability in the food supply chain as an important tool in ensuring food quality and safety of the products as well as improving their confidence (Bertolini *et al.*, 2006; Aung and Chang, 2014). In this perspective, this study elucidates the role of product traceability importance on the relationship between product authenticity and consumer willingness to pay for a food product, specifically for organic olive oil. In particular, by conducting an exploratory analysis based on a quantitative methodology focused on a Confirmatory Factor Analysis (CFA) to test the measurement model to ensure the reliability and validity of the constructs, and a moderation and a mediation analysis (Hayes, 2018), the study has effectively investigated the role assumed by product traceability. The findings shed some light on the under-investigated nature of the role of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, by providing preliminary evidence that the importance of product traceability served as a mediator in the relationship between product authenticity and consumer willingness to pay for organic olive oil.

This study is the first to explore the role of the importance of product traceability in the relationship between product authenticity and consumer willingness to pay, in general, and in the organic olive oil sector, in particular. Statistically, the results indicate that food product traceability is considered a significant mediator in the relationship between product authenticity and consumer willingness to pay since product authenticity had a weak direct effect on consumer willingness to pay. These results revealed that product authenticity is significantly and positively correlated with the importance of product traceability and consumer willingness to pay. Hence, consumers who are exposed to product authenticity signals tend to be more aware of the importance of product traceability which, in turn, produces a greater willingness to pay more. Moreover, the results showed that the importance of product traceability has a significant and positive effect on consumer willingness to pay. In other words, the importance of the traceability of the product (e.g., its ability to elicit food safety) enhances the willingness to pay for organic olive oil. In fact, in the agricultural and food supply chain, the traceability system of the product is oriented to identify actors, activities, operations, and relations involved in the cultivation, production, and distribution processes in order to increase food safety since traceability can be seen as a subsystem whose presence is indispensable to the management of food quality (Peri, 2002). Therefore, product traceability is an essential tool for guaranteeing both production and product quality (Becker, 2000). In this context, the signals of product authenticity such as the origin of the product and the genuineness of the product could increase consumer awareness of the importance of product traceability, providing reassurance during the selection and purchase process. Based on this product traceability-based mechanism, consumers who are exposed to product authenticity signals tend to be more aware of the importance of product traceability and, consequently, tend to be more willing to pay a higher price for the product.

The present study provides several theoretical contributions. Firstly, it contributes to the existing literature on the authenticity of agri-food products (Groves, 2001; Camus, 2004; Verbeke and Ward, 2006; Lunardo and Guerin, 2007; Kendall *et al.*, 2019) by investigating the relationships between product authenticity and willingness to pay for organic olive oil that consumers consider at high risk of non-compliance, fraud, and scandal (Casadei *et al.*, 2021). Secondly, the study further increases our understanding of the role assumed by the importance of product traceability, by underlining its mediation role in the relationships between product authenticity and consumer willingness to pay. In this respect, the study considers in the analysis the construct of traceability, which despite its underlined importance in the agri-food supply chain (e.g., Olsen and Borit, 2013; Papetti *et al.*, 2012; Engelsen *et al.*, 2014), has so far received limited attention.

From a managerial point of view, this study points to several implications both for firms and policymakers. Firstly, a better understanding of consumer perceptions of the authenticity of agri-food products assumes a particular relevance for product development processes, by permitting firms to effectively consider the determinants correlated to customer satisfaction,

customer loyalty, and willingness to pay more. Indeed, the aspects linked to authenticity, quality, and safety of agri-food products influence the consumer decision-making processes more and more. Secondly, by showing the findings on the importance of traceability, perceived as a new tool of safety and quality, the study underlines that firms must develop and implement well-structured traceability systems to guarantee useful transparency and meet consumer requirements. In this way, firms may benefit by providing information on the processes used for their products, the integration of production processes that involve different actors (such as suppliers), the distribution and location of products, by effectively guaranteeing the quality of materials and eliminating the possibilities of fraudulent activities along the supply chain. Certainly, the definition and adoption of internal traceability systems improve food safety, since traceability can be seen as a subsystem whose presence is fundamental to the management of food production and product quality, even if traceability in the supply chain involves several changes both in work processes and software systems. The costs associated with putting traceability systems into place are seen as quite expensive, requiring investments in hardware and software, skilled human resources, training, and certification. However, customer demand for real-time information about the products they buy will increase and will be one of the competitive advantages of agri-food industry marketing. Additionally, the benefits gained from traceability for high-risk and high-valued food far outweigh the cost of traceability (Aung and Chang, 2014). Thirdly, moving from the role of traceability as a potential risk management tool for public health purposes, it may be useful to develop efficacious activities and initiatives of education and awareness campaigns, including more effective information dissemination, in order to reduce consumer anxiety and uncertainty and to improve consumer confidence in the food industry.

Notwithstanding its contribution to the marketing literature, this study presents some limitations, mainly related to the methodology, by stimulating further research directions. Firstly, this study adopted an exploratory approach, requiring the translation of this preliminary research question into more specific hypotheses and propositions. Secondly, this research was developed only in the Spanish context. It would be useful to corroborate the investigation by expanding the geographical boundaries of the analysis to other relevant olive oil producing countries, such as Italy and Greece. Thirdly, the study doesn't analyze the type of influence that certain variables such as demographic ones or variables related to consumer motivations may have on food product authenticity. Finally, consumer ethnocentrism represents an interesting element for future directions of research. By considering the measures used for the authenticity of the product (for example, a typical Spanish product, reflects the country of origin, typical product), the effect of product authenticity on the willingness to pay could be greater for consumers with a high level of ethnocentrism than for those with a low level of ethnocentrism.

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The role of cognitive frames towards circular economy practices in SMEs

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Abstract

Frame of the research: *The paper explores how organizations are able to manage potential competing logics in the HORECA and Hospitality sectors. In such sectors, mainly characterized by SMEs and where the effect of brand and corporate reputation is not comparable with some manufacturing sectors operating in the B2B market, finding an equilibrium between the economic and environmental need is crucial in order to truly embrace environmental sustainability.*

Purpose of the paper: *The development of an integrative cognitive framework in management where environmental and economic views are strictly enwound, is crucial for supporting the transition towards a more circular economy. The paper explores the drivers for developing such integrative view for the managers of SMEs operating in the hospitality sectors.*

Methodology: *The research is grounded on original data collected by a survey of 252 Italian SMEs operating in the hospitality sector. Adopting a structural equation model, we tested the drivers that can contribute to create respectively an environmental and economic logic in managers, whether the co-presence of these logics is able to generate an integrative view and, as a consequence, the influence of such view on the adoption of pro-environmental practices.*

Findings: *The results confirm the environmental concern being a driver of environmental logic, the importance of the environmental logic and the economic one as determinants of the integrative view and the importance of such view in adopting pro-environmental practices.*

Research limits: *The study is focused on a specific geographical context. The number of drivers of environmental internalization could be expanded.*

Practical implications: *The study contributes to the steam of research on sustainability among SMEs by stressing how intangible factors are crucial for reaching environmental embeddedness.*

Originality of the paper: *Understanding how organizations are able to manage potential competing logics in an integrative cognitive framework is still unexplored, mainly in the Hospitality sectors. In such sectors finding an equilibrium between the economic and the environmental need is crucial for really embracing environmental sustainability.*

Key words: *cognitive frames; circular economy; SME; pro-environmental practices; hospitality sector.*

1. Introduction

A growing global demand of products and services has increased the need of natural resources and has contributed to the deterioration of the natural ecosystem (UNEP, 2019).

Numerous institutions have increased their efforts for supporting the economic transition towards a more circular and sustainable pattern and make compatible increasing profit and environmental protection (Porter and Kramer, 2011; Gusmerotti *et al.* 2019). As a consequence, citizens and consumers are becoming more demanding in terms of environmental commitment of companies (Testa *et al.*, 2020). In addition, in the hospitality sector, consumers have demonstrated more attention towards the environmental footprint of hospitality and food service (Passafaro, 2020).

However, the increasing pressure from external stakeholders have not generated an isomorphic response from organizations (Boiral *et al.* 2017). In some cases, managers are not able to adopt a cognitive framework where environmental and economic views are integrated causing a decoupling between real environmental performance and external green image (Greenwood *et al.* 2011; Testa *et al.*, 2018). In such circumstances, economic benefits are just in the short term, linked to a precarious improvement of corporate reputation (Marquis *et al.*, 2016), whereas, environmental actions are just superficial and are mainly related to communication actions such as signing an official declaration or publishing sustainability reports (Macellari *et al.*, 2021). Only a cognitive framework where sustainable principles are enwinding into strategy and operations can generate a substantial economic advantage. This assumption is particularly valid in the case of SMEs which are characterized by an endemic lack of financial and physical resources (Testa *et al.*, 2016). For instance, as highlighted by a recent study carried out by Iraldo *et al.*, (2017) focused on the HORECA sector, just a deep managerial commitment and the adoption of practices recognizable by customers can generate a positive effect of economic performance. However, even if there is a wide consensus among scholars that sustainability embeddedness is a *conditio sine qua non* for producing a positive effect on economic performance the debate on which factors are able to lead the institutionalization of sustainability principle is still ongoing (Aguinis and Glavas, 2013). Starting from the consideration that the institutional environment is complex and it is a source of competing logics, some scholars have focused their attention on the managerial approaches on potential conflicting logics such as environment and economic logic (Van der Byl and Slawinski, 2015). Understanding how organizations are able to manage potential competing logics in an integrative cognitive framework, to our knowledge, is still unexplored, mainly in the HORECA and Hospitality sectors. In such sectors, mainly characterized by SMEs and where the effect of brand and corporate reputation is not comparable with some manufacturing sectors operating in the B2B market, finding an equilibrium between the economic and environmental need is crucial in order to truly embrace environmental sustainability. In order to contribute to this search of understanding, following the categorization provided

by Van der Byl and Slawinski (2015) we explored which factors develop an integrative view to the managers of SMEs operating in the HORECA sector. The novelty of the research relies its contribution on shedding light on which beliefs influence the creation of an integrative view supporting the emerging literature on the managerial approach towards sustainability. Moreover, taking inspiration from previous empirical studies, we designed and tested new measurement scales for measuring the integrative cognitive frame as well as the environmental and economic logic, and offer to other scholars useful tools to continue on this steam of research.

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The role of cognitive frames
towards circular economy
practices in SMEs

2. Literature review

There are several examples in the managerial literature of researches exploring the benefits of companies deciding to protect the environment while conducting their operations (Porter and van der Linde, 1995; Hart and Ahuja, 1996). Generally, green practices are those activities approached by a firm aiming at reducing the environmental footprint (Ortiz-de-Mandojana and Bansal, 2016). Plenty of environmental management researchers (e.g. Van der Byl and Slawinski, 2015) explored the importance of a cognitive framework in which there is an alinement between the environmental logic and the economic one; in a way where an “advance in one aspect of sustainability should trigger as well an advancement in the economic dimension” (Van der Byl and Slawinski, 2015).

There are researches exploring the interrelation of the integrative view (environmental and economic) of firms operating in the hospitality sector that show a positive relationship between green practices and financial results. For instance, Bagur-Femenias *et al.* (2013) in their work found out that the adoption of green practices in travel agencies allowed them to differentiate themselves from competitors while, at the same time reduce operative costs. Analogously, studies grounding on firms operating in the hospitality sector suggest a positive relation between the adoption of green strategies and short-term financial performance (Leonidou *et al.*, 2013; Cerchione and Bansal, 2020). Many of those researches, also framed in the Italian context, suggest that the adoption of a proactive environment strategy, translating into different actions, resulted in economic benefits represented by greater booking opportunities (Franco *et al.*, 2021), higher tourism destination competitiveness (Cucculelli and Goffi, 2016), etc.

However, the literature exploring linkage between environmental and financial performance has not shown definitive conclusions. During the last few years, some researchers underlined that the mere adoption of environmental actions and practices is not enough for gaining economic benefits as well; environmental actions and practices should be indeed deeply embedded into the firm to produce an economic result (Bromley and Powell, 2012). For instance, some studies (Boiral *et al.*, 2017; Testa *et al.*, 2018) grounding on the neo-institutional theory suggested that firms could ceremonially embrace environmental actions and practices aiming at assuring conformity with institutional requests in order to receive the external legitimacy although enduring operating as usual. Similar

discrepancies are underlined by researches exploring firms operating in the hospitality sector (Claver Cortés *et al.*, 2007; Tarí *et al.*, 2010). For instance, Bagur-Femenias *et al.* (2016) analyze the differences in adopting the ISO 14001 environmental certification and Eco-Management and Audit Scheme (EMAS) by Spanish hotels. The authors conducted a survey of 210 small Catalan hotels to investigate whether the adaptation of the certification was ceremonially done or was supported by a strong commitment to green practices. The authors underlined a significant difference between the two behaviors, with the former, strongly committed to green practices, obtaining better financial results than other hotels, while the latter showing some sort of misalignment in their external image casted to different stakeholders. In such framework, our research aims at better understanding the alignment of the economic logic and the environmental one as drivers of the adoption of proactive environmental practices from the firms operating in the hospitality sector.

2.1 Hypothesis development

For a firm the consideration of the environment might arise from different sources, such as: regulations, stakeholders, supply chain partners, etc. Those actors represent different typologies of subjects which a firm is seeking to consider by displaying environmental concern. However, as suggested by Dechant and Altman (1994), individual's desires and expectancies about the environment are only partially guided by external forces. Indeed, the same desires and expectancies may also be motivated by an individual concern for the natural environment and the role a subject believes it should play in the societal setting. Shultz (2000) defines environmental concerns as that kind of feeling people develop associated with the degree to which they view themselves interconnected with nature. Davis *et al.* (2009) suggest that a high degree of environmental values (or concern for the environment) acts as a form of personal identity for an individual. For such reason, individuals exhibiting strong environment values or concern for the environment would have a high degree of commitment to the environment, which in the business setting, might drive to the adoption of an environmental logic. In the literature, the role of environmental concern as predictor of environmental logic in firms is not generally explored, and especially for those firms operating in the hospitality sector. For such reason, in order to fully understand such aspect, we formulate the following hypothesis:

H1. there is a positive relationship between the environmental concern and the environmental logic of a firm operating in this sector.

Entrepreneurs may choose to adopt a proactive environmental strategy regardless of external pressures or their goal of profit maximization. Among these, the environmental logic defined as the intention and willingness of the business owner or managers to be engaged in environmental management for reducing the environmental impact is highlighted in many studies. In larger businesses, several researches, showed that firms with

managers holding strong environmental logic help implementing a set of business strategies aiming at the reconciliation of environmental goals with economic goals (Dibrell *et al.*, 2011; Barr, 2007). The importance of such logic is also underlined by Bowen and colleagues (2001) that identified it as one possible explanation for diverging environmental strategies of firms which operate in similar sectors. In the hospitality sector, for instance, Molina-Azorín *et al.* (2009) analyzing a sample of hotels located in Spain, revealed that a managerial logic committed towards the environment translates into a greater integration of environmental consideration in traditional business logics. Similar suggestions are underlined also by Claver-Cortés *et al.* (2007) and Cerutti *et al.* (2016). However, the role of the environmental logic as a driver for the adoption of an integrated view in firms seems almost neglected for other typologies of firms operating in the same sector (i.e. restaurants, bathhouses, etc.). To fully understand the impact of the environmental logic in the adoption of an integrated view in different typologies of firms operating in the hospitality sector, we thus formulate the following hypothesis:

H2. there is a positive relationship between the environmental logic and the integrative view for firms operating in this sector.

Environmental pollution might harm firms in several ways. In some sectors, for instance, there are studies that have underlined the economic impacts associated with marine litter such as reduced fishing, public health effects, and reduced revenues for tourist activities (Hoagland and Scatasta 2006; Newman *et al.*, 2015). Similar impacts were found also with business activities relying on nature-based amenities endangered by pollution issues (Huybers and Bennett, 2003; Bruzzi *et al.* 2011). In such context, firms might directly respond in order to address the environmental damage causing a concrete harm for them. For instance, restaurants have been proved to adopt initiatives such as reduced plastic consumption and waste prevention initiatives also due to the economic damages caused to their business by the pollution surrounding their area (Kim and Hall, 2020). However, even if there are some marginal evidences of such actions taken by firms in order to respond to the economic losses related to the pollution, there is the need to further investigate such aspect. For such reason, in order to understand the impact of the role of the economic damage perception caused by pollution in the hospitality sector we thus formulate the following hypothesis:

H3. there is a positive relationship between the economic damage perception and the economic logic supporting firms in the adoption of integrative view for firms operating in the hospitality sector.

The seminal work of Hart (1995) outline how firms adopting strategies integrating the environmental view with the economic one might gain a competitive advantage, for instance by better utilizing resources, incurring in lower costs or avoiding regularity actions. Since then, several other researchers have investigated such relationship. Brammer and colleagues

(2012), for instance, demonstrated that the reduction of production costs represent a fundamental driver for including environmental aspects into the strategic business process. Within the hospitality sector, there is several evidence from the literature that suggests a strong linkage between the economic logic of reducing cost related to water, energy, and waste management as drivers for the adoption of a complete economic-environmental integrative view (Beccali *et al.*, 2009, Bagur-Femenias *et al.*, 2013). Even if literature seems to agree on the fact that the economic logic might represent a strong driver for the adoption of an integrated view in hospitality firms; Perramon *et al.* (2014) suggest that the intensity of such relationship might be influenced by the dimension of the firm. Indeed, smaller structures (such as restaurants) might perceive negligible economic incentives in considering environmental issues into their strategies. To fully understand the impact of the economic logic in the adoption of an integrative view in the hospitality sector we thus formulate the following hypothesis:

H4. there is a positive relationship between the economic logic and the integrative view for firms operating in this sector

According to Lefebvre *et al.* (2003) a higher level of proactive management of environmental issues may be able to establish a positive association between the environmentally oriented managerial and operational actions to improve environmental performance. In such perspective, an integrative view represents the fundamental prerequisite for adopting pro-environmental actions and achieve an overall better environmental performance. Also in this case, there is some evidence of such relation in business operating in the hospitality sector. The adoption of an integrative view directly translated to the implementation of voluntary tools in the hotel industry (Ayuso, 2006) represented for instance by codes of conduct, eco-labels, environmental management systems (EMSs) and environmental performance indicators. More empirical evidence regarding the impact of the integrative view on the adoption of pro-environmental actions in the hospitality sectors is essential; for such reason, in order to fully understand how the adoption of an integrative view translate to pro-environmental practices, we thus formulate the following hypothesis:

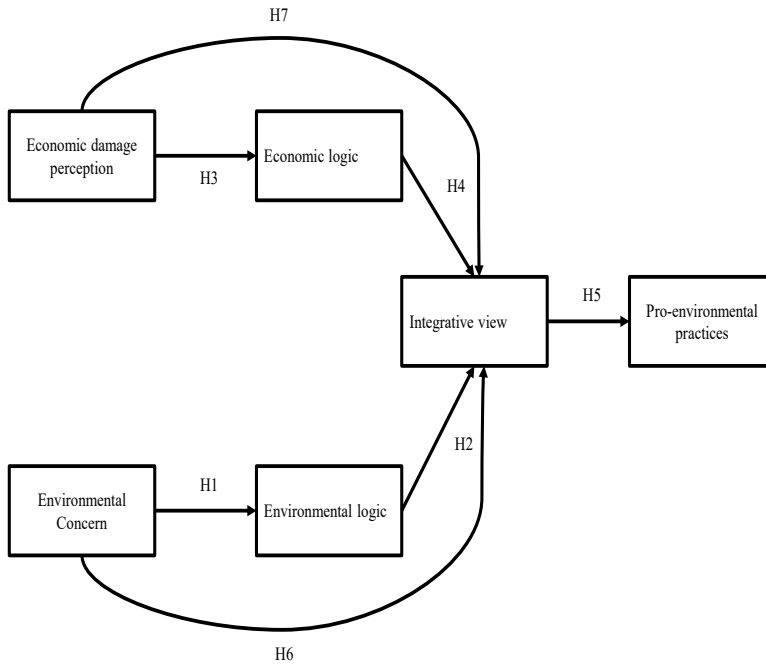
H5. there is a positive relationship between the integrative view and the pro-environmental practices for firms operating in this sector.

Finally, to fully understand the determinants of the integrative view in SMEs operating in the hospitality sector we aim at testing as well the following two mediation hypotheses:

H6. the environmental logic has a mediation role between the environmental concern and integrative view.

H7. the economic logic has a mediation role between the economic damage perception and the integrative view.

Fig. 1: Diagram of the hypotheses to test



Source: our elaboration

3. Method

3.1 Data collection

The research is grounded on the results of a questionnaire completed by firms operating in the hospitality sector (i.e. hotels, restaurants and bathhouses) located in the coastal area of the Tuscany region.

The questionnaire was grounded on the existing literature and designed and adapted in order to provide fruitful information to test the previously presented hypotheses. After the questionnaire was designed, it was tested by five firms operating in such sector. Feedbacks originating from such process were then considered for revising and finalizing the questionnaire. Once the questionnaire was ready, it was then administered by physically visiting the target firms. In more details, the questionnaire was administered in person with a face-to-face interview conducted in the respondent's firm. Visits to firms operating in the hospitality sector located in the coastal area of the Tuscany region were organized in the period ranging from February 2017 and May 2017.

There are many advantages in adopting this modality; for instance, administering the questionnaire in person allowed us to reduce the uncertainty of responses, as a clarification could have been directly provided, and collect a full set of completed questionnaire guaranteeing a

very low drop off rate. Moreover, the interviewer was better able to control the pace of the interview and might have been able to help the respondent to minimize distractions.

The researcher involved in the administration of the questionnaire was appropriately trained in order to briefly introduce the questionnaire and the aim of the study and to assure the confidentiality and anonymity of the information collected. Those aspects of confidentiality and anonymity could be detrimental to properly address social desirability bias (i.e. the tendency of a respondent to answer in the most favorable way) (Tourangeau and Yan, 2007). The respondents were selected by adopting a random sampling approach using list of companies that are available from the local Chamber of Commerce. A total of 300 firms were identified adopting such sampling approach which are adequate for generalizing the population of Italian firms described by ISTAT (ISTAT, 2020) data related to the year 2017 which are presented in Table 1.

Tab. 1: Population of Italian firms

Business activity	n° of firms	% of firms
Hotel	51.448	15%
Restaurant	276.609	83%
Bathhouse	6.902	2%
Total	334.959	100%

Source: our elaboration

The administration of the questionnaire allowed to collect a total of 252 completed surveys; some descriptive statistics of the respondents are presented in Table 2.

Tab. 2: Descriptive statistics of the respondents

Business activity	n° of respondents	% of respondents
Hotel	130	52%
Restaurant	85	34%
Bathhouse	37	15%
Total	252	100%
Firm Size	n°	%
less than 10	191	76%
from 11 to 50	56	22%
more than 50	5	2%
Total	252	100%

Source: our elaboration

Given the fact that the number of respondents was slightly lower than the target, we used the Dillman (2011) formula to assess whether the sample size was representative of the Italian population. According to such formula, the optimal number of respondents would have been

269 respondents, for generalizing to a population at a 90% confidence level with a $\pm 5\%$ margin of error. Usually a slightly lower sample size is generally accepted in social studies (Wang *et al.*, 2016). Thus, our number of respondents might be considered suitable for our analysis.

When using self-reported data and all variables assessed are originated from the same source, the common method variance could represent a bias. In order to avoid such issue, we conducted Harman's single-factor post-hoc test (Podsakoff and Organ, 1986). As such test did not identify factors accounting for the majority of covariance among the variables, we can confirm that the common method variance is not a concern with the data acquired.

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3.2 Measurements

Similar researches in the field were used to deploy the measures adopted in our research; those measures are presented more in detail in the following paragraph.

Moving from the research conducted in the hospitality sector by Leonidou *et al.*, 2013 and Tarí *et al.*, 2010 we identified some pro-environmental practices that might fit to the businesses operating in this field. Those are related for instance to increasing the use of recycled materials (i.e. recycled paper, recycled plastics) and actions aimed at reducing the quantity of waste produced or their dangerousness. The measurement scale used was a 5-point Likert scale ranging from one ("strongly disagree") to five ("strongly agree"). Cronbach's α was then applied to assess the internal consistency of the construct, the result equal to 0.72 confirms an adequate consistency.

The integrative view was derived from the research conducted by Henriques and Sadorsky's (1999). More in detail, three items were used to assess the environmental responsibility; in detail we asked to the respondents the agreement with the following statements: i) my company has an environmental responsibility as well as the goal of making a profit; ii) Business ethics and environmental responsibility are fundamental to the survival of a company; iii) Environmental responsibility and profitability can be compatible. Also in this case, a five points Likert scale was adopted. Items were merged into a single factor with an internal consistency which was assessed with the Cronbach's alpha of 0.88.

We used three items to measure the economic logic as well. In this case we identified those grounding on the work of Masurel (2007) that allowed us to define the following items: i) offering products and services with less environmental impact can be an advantage over the competition; ii) reduce costs influenced my company's decision to implement waste reduction initiatives (e.g. avoid costs thanks to energy savings or thanks to reductions on the tax / waste tariff); reduce risks influenced my company's decision to implement waste reduction initiatives (e.g. thanks to preventive actions or improving emergency management). Also in this case, the measurement scale used remained unaltered. Items were combined into a single factor with an internal consistency (Cronbach's α) of 0.92.

The economic damage perception was also measured with 3 items using a five-points Likert scale to understand the agreement of the respondents. More in detail, previous literature in the field (Lozoya *et al.*, 2014; Cole, 2014) was used to draw the following items: i) the presence of waste damages the image of the area; ii) tourists do not return to places where the beaches are dirty; iii) tourists do not return to places where the sea is dirty. The measurement scale used remained unaltered and items were combined into a single factor with an internal consistency of 0.94.

The environmental logic was derived from researches conducted by Dibrell *et al.*, 2011 and Barr, 2007. This allowed us to identify the following statements: i) I undertake more than the necessary to guarantee respect for the environment; ii) My employees and I work hard to prevent waste formation. Also in this case, we asked respondents their agreement using a 5 points Likert scale and items were combined into a single factor with an internal consistency (Cronbach's α) of 0.81.

Finally, the environmental concern construction was grounded on researches from Schultz (2000), Schultz (2001). More in details, three items were used to assess the respondents' agreement about the fact that environmental problems can cause severe consequences to: i) myself; ii) my health; iii) my future; iv) the animals; v) the plants; vi) the sea. In this case, the measurement scale used was a 7-point Likert scale ranging from one ("strongly disagree") to seven ("strongly agree"). Items were combined into a single factor with an internal consistency (Cronbach's α) of 0.92.

4. Results

In order to test our hypotheses, the data acquired through the questionnaires, were processed by adopting a structural equation model. As is well known, the structural equation modelling process consists of two fundamental steps: first, a validation of the measurement model and second, a further step consisting of fitting the structural model by a path analysis with latent variables.

4.1 Validation of the measurement model

A confirmatory factor analysis was carried out on the purpose of assessing the properties of the measures. Table 3 presents the fit indices of the measurement model. In more detail, the table shows: the chi-square difference (χ^2), the degrees of freedom (df), the chi-square statistic adjusted by its degrees of freedom (χ^2/df), the comparative fit index (CFI), the Tucker- Lewis index (TLI), the root-mean-square error of approximation (RMSEA) and the p of Close Fit (PCLOSE).

As explained by Barrett (2007), a good model fit would provide a non-significant chi-square result. Nonetheless, according to Iacobucci (2010), the chi-square statistic is a test sensitive to sample size (i.e. the chi-square statistic most of the time rejects the model when large samples are used). For such reason, a model has a reasonable fit when the chi-square statistic adjusted by its degrees of freedom (χ^2/df) does not exceed 3.0 (Kline, 2005) as in our case. The comparative fit index (that usually should be ≥ 0.90 to

demonstrate a good fit), the Tucker-Lewis index (that usually should be ≥ 0.95 to demonstrate a good fit) and the RMSEA (that usually should be <0.08 to demonstrate a good fit) can be regarded as a good model fit.

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Tab. 3: Assessment of the measurement model

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	PCLOSE
Measurement model	302.71**	133	2.27	0.96	0.95	0.072	0.07

**p<0.01

Source: our elaboration

Furthermore, we examined whether the common method variance (CMV) could magnify the data and lead to potential misjudgment. Relying on the study by Podsakoff *et al.* (2003) we adopted the single common method-factor approach; this test requires adding a common factor (latent variable) to the measurement model. All items were loaded on their theoretical constructs as well as on a created latent method factor. Then, the significance of the structural parameters is examined both with and without the latent factor. Ultimately, if, like in our case, the measurement model with a common factor returns the worst fit than the measurement model, we can be sure that the bias is not able to influence the findings.

Moreover, the Composite Reliability (CR) and Max Reliability (MaxR(H)) of the constructs were also assessed. CR is used to measure the construct reliability by drawing on the standardized loadings and measurement errors for each item (Fornell and Larcker, 1981), and it is acceptable when the value is above 0.7. Max Reliability (MaxR(H)) estimates the reliability of the scale's optimally weighted composite; MaxR(H) is acceptable when the value is > 0.80 . Table 4 shows the reliability and validity results.

Table 4 shows also the Average Variance Extracted (AVE) and the Maximum Shared Variance (MSV). Those indices can be relied on to check the convergent validity and the discriminant validity of the measurement model. As stated by Cunningham *et al.* (2001), the convergent validity is used to measure if the items of a construct that are theoretically related are effectively related. Instead, the discriminant validity measures if the items of a construct are not correlated with other items not conceived to assess such construct (Ha and Stoel, 2009). Normally, if the value of the AVE is greater than 0.5 this indicates a good level of convergent validity of the constructs (Hair *et al.*, 1987). Finally, as supported by several authors (Fornell and Larcker, 1981; Hair *et al.*, 2010) discriminant validity is established by MSV when the value of MSV is lower than the AVE for all the constructs. As presented in Table 4, all the AVE values are greater than MSV and for such reason, discriminant validity is demonstrated.

Tab. 4: Reliability and validity results

	CR	AVE	MSV	MaxR (H)	Economic logic	Economic damage perception	Integrative view	Pro-environmental practices	Environmental logic	Environmental concern
Economic logic	0.921	0.796	0.404	0.947	0.892					
Economic damage perception	0.947	0.856	0.060	0.955	0.120	0.925				
Integrative view	0.874	0.698	0.382	0.886	0.319	0.151	0.836			
Pro-environmental practices	0.828	0.711	0.404	0.926	0.636	0.042	0.273	0.843		
Environmental logic	0.835	0.717	0.382	0.835	0.324	0.228	0.618	0.268	0.847	
Environmental concern	0.951	0.765	0.099	0.980	0.272	0.244	0.314	0.161	0.212	0.875

Source: our elaboration

4.2 Fitting the structural model

Together with the fit indices of the structural model, also the results are presented in figure 2. The structural equation model tested demonstrates a satisfactory goodness-of-fit indices ($\chi^2/df=2.481$, CFI=0.951, TLI= 0.941, RMSEA=0.068) The variance predicted by the overall model was 0.421.

The coefficients of the model show a positive and significant relationship between environmental concern and environmental logic (Hypothesis 1) ($\beta = 0.24$, $p < 0.00$), but they fail to corroborate the existence of a significant relationship between economic damage perception and economic logic (Hypothesis 3).

The model asserts the importance of environmental logic by showing a positive and strong relationship with the integrative view (Hypothesis 2) ($\beta = 0.59$, $p < 0.00$). Furthermore, a moderately strong positive relationship between the economic logic and the integrative view (Hypothesis 4) ($\beta = 0.19$, $p < 0.01$) emerges.

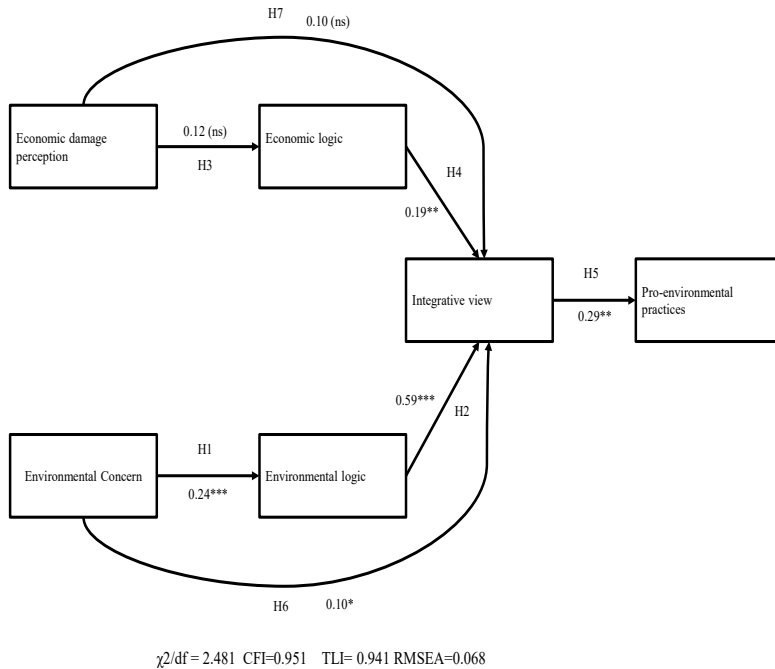
Moreover, a positive and significant relationship has been found between the integrative view and the pro-environmental practices (Hypothesis 5) ($\beta = 0.29$, $p < 0.01$).

Hypothesis 6, testing the mediation effect of environmental logic between environmental concern and integrative view can be retained even marginally statistically significant. Finally, Hypothesis 7 testing the mediation effect of economic logic between economic damage perception and integrative view cannot be retained as not statistically significant. The mediation tests are presented in table 5.

Tab. 5: Mediation tests

Hypotheses tested	Indirect effect (Sig.)	Mediation
H6. Environmental concern - environmental logic - integrative view	0.104 (0.091)	Yes
H7. Economic damage perception - economic logic - integrative view	0.10 (0.532)	No

Source: our elaboration



Source: our elaboration

5. Discussion and conclusions

By performing a structural equation modelling, the study investigates the influencing factors of environmental proactiveness in small and medium organizations operating in the hospitality sectors. The findings reveal that the adoption of circular practices is stimulated by a cognitive frame based on an integrative view. In other words, the managerial belief that economic and environmental goals are not incompatible is crucial for making managers aware that is possible to pursue both objectives simultaneously. It is at least two decades that empirical studies have found that green practices can lead to a better economic performance (Ambec and Lanoie, 2008; Miroshnychenko *et al.*, 2017) but this relation is not always confirmed. With our study, we stressed the importance that decision to adopt green practices cannot be driven only by short-term economic goals otherwise some green actions, relevant for supporting the circular transition, may be skipped. Moreover, for developing an integrative view it is important that a manager believes that environmental actions can be profitable and decisions on environmental actions are taken by considering the economic effect of those actions. However, managers need to develop an environmental commitment for developing an integrative view. This finding is in line with several empirical works which have emphasized the role of green-oriented beliefs in large and SMEs organizations (Papagiannakis and

Lioukas; Testa *et al.* 2016). In addition, the study seeks to investigate which personal beliefs influence the creation of an economic and environmental logic. As emphasized by previous studies focused on the managers' decision-making process towards environmental action (Cordano and Frieze, 2000) individual environmental concern plays a significant role. In detail, our study found that a manager's environmental concern had a direct effect on the personal environmental logic and a mediated effect on the formation of an integrative cognitive frame. Symmetrically, we explored which factors are behind the formation of an economic logic by focusing on the belief that a degraded local environment may decrease the number of customers and, consequently, have a negative economic effect on hospitality organizations. Contrary to what we initially expected this belief seems to have no effect on individual economic logic that probably have other influencing factors or, currently, local customers are, in the respondents' perceptions, attracted more by other local specificities.

The study contributes to the literature in several ways. First, this research responds to the invitations of Aykol and Leonidou (2014) for further studies for understanding why small organizations adopt green practices. In particular, our research seeks to explore the role of cognitive frames in pushing managers to carry out green actions by enlarging the empirical evidence provided by previous studies mainly focused on stakeholders' actions and managers' environmental commitment (Testa *et al.*, 2016). Second, the study contributes to the growing debate on the role of cognitive frames for understanding the internalization of environmental principles (Van der Byl and Slawinski, 2015; Hahn *et al.*, 2018) by providing also an empirical evidence based on a quantitative approach and integrated the current research mainly focused on conceptual or qualitative studies. Third, the study provides an original contribution to the emerging literature in which there are the drivers of environmental proactivity of hospitality organizations (Pérez and del Bosque, 2014; Jones *et al.*, 2016) and create an updated linkage between sectoral literature and the recent literature on the field of business and natural environment.

We believe that the results have managerial implications for both managers and policy makers. Managers of hospitality organizations shall overcome the contraposition between economic and environmental benefits and an integrative approach may align the two different logics. This is a prerequisite for achieving significant environmental performance gains that in turn might result in large cost reductions, which can be critical for the competitiveness of hospitality organizations. Nowadays, the growing attention of institutions and consumers to the need of a transition towards a circular economy (Gusmerotti *et al.*, 2019) have increased the possibility to adopt such an integrative view. Managers must also recognize that circular economy principles must be incorporated in a synergic manner into a company in order to be successful. This means that "circularity" should contaminate the whole company and, as a result, cover all business processes, from the selection of suppliers, through the resource used (i.e. energy and water) and waste management including all operational activities and market communication. A focus just on some of these operations may limit the potential win-win opportunities associated

with the circular economy as merely focusing on communication and marketing activities may be perceived as greenwashing by the market.

In more concrete terms, some actions to start with might be represented by the use of recycled materials in the hotel and restaurant products or the selection of a renewable energy contract. Such simple actions may communicate the environmental commitment of an organization and encounter the needs of a consumer increasingly concerned about environmental issues. In addition, the adoption of waste prevention, mainly focused on food waste, can simultaneously generate multiple benefits such as: i) cost benefits due a better management of food storage; ii) increased customers' satisfaction, iii) reduction of environmental footprint and contribution to sustainable development goals.

Policy makers can also acquire some lessons from this study. In particular their role is crucial when an integrative view is threatened by an economic crisis. Taking into consideration that the COVID-19 pandemic has mainly affected the hospitality sectors due to citizens circulation and sociality restrictions, it is important to sustain the sector by supporting managers to carry out actions that are compatible with the environmental and social needs. Moreover, local institutions may design and implement initiatives to make recognizable the efforts carried out by the hospitality organizations for protecting the environment. Green cards which allow a consumer to cumulate points that give access to discounts or other benefits as well as local labelling systems are just some examples of initiatives that can be implemented.

Further research is needed to better explore the drivers of environmental internalization among hospitality organizations. The limitations of the present study indicate directions that scholars could take for further investigating this topic. First, this study is focused on a specific geographical context and the sample only marginally reflected the composition of the sectoral universe at national level. Therefore, for checking the generalizability of the findings, scholars should replicate the empirical model in diverse geographical settings for searching common trends and country-specific cultural factors. Second, future research should enlarge the number of drivers of environmental internalization to test and explore the reciprocal influence. For instance, studies should include contextual factors that can influence the firms' motivation to adopt environmental practices (Bansal and Roth, 2000). Moreover, the financial condition of a company may influence its ability to integrate an economic and environmental view by generating intertemporal tensions (Slawinski and Bansal, 2015). This situation may be particularly critical for hospitality organizations that are mainly SMEs and have been seriously affected by the restrictions due to the COVID 19 pandemic. Moving on the downstream of our empirical model, between managerial approach and environmental sustainability and the adoption of profound environmental practices, there are an organization's dispositions and capabilities that can influence that relation (Teece, 2007; Zollo and Winter, 2002). Therefore, scholars should devote attention to explore, for instance, the mediating role of internal capabilities and skills, employees' behavior and attitudes and leadership styles.

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The intersection between SMEs' business strategies and the phases of unexpected events: a systematic review of the literature

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Abstract

Framing of the research: Despite the relevance of crisis management for SMEs, existing literature primarily targets large firms, therefore paying less attention to smaller businesses. As a result, the manner in which SMEs transform their business strategies during the specific phases of unexpected events remains an unexplored research topic.

Purpose of the paper: The present conceptual paper aims to develop a framework examining the kind of strategies that may be implemented by small and medium-sized enterprises (SMEs) throughout the different stages of unexpected events.

Methodology: The paper reports a systematic literature review (SLR) to summarize how SMEs react in times of crisis and illustrate core themes in previous research in relation to the phases of crisis prevention, response, and recovery.

Findings: The study develops a circular event framework and illustrates the leading business strategies implemented by SMEs in different moments of unpredicted circumstances: (1) flexible planning, financial resources equipment, proactiveness, and collaboration during the crisis prevention phase; (2) cost minimization and cash flow protection, revenue generation - operations and business model pivoting, stakeholder relationships, and dynamic approaches during the crisis response phase; (3) business model re-configuring, and stakeholder and employee relationships re-establishment, in the crisis recovery phase.

Research limits: The conceptual nature of this work stimulates further theoretical and empirical studies. Future research should empirically test and validate the proposed framework within specific research settings.

Practical implications: The present research represents a useful benchmark for managers and practitioners to better understand what strategies are suitable according to the specific moment of the crisis.

Originality of the paper: This study analyzes the evolution of SMEs' business strategies in times of crisis from a novel perspective by pointing out the prevention, response, and recovery phases' circularity.

Key words: Crisis management; disaster; recovery; resilience; Covid-19; SMEs; business strategies

1. Introduction

Crisis management defines a systemic procedure, supported by internal and external stakeholders, aimed at identifying signs of crisis, avoiding

and planning for possible distress, and recovering and learning from the crisis (Mitroff, 1988; Pearson and Mitroff, 1993; Pearson and Clair, 1998).

Scholars have developed two main conceptualizations of crisis: crisis-as-an-event and crisis-as-process. The crisis-as-an-event perspective mainly focuses on investigating the aftermath of a crisis. Conversely, the crisis-as-process perspective focuses on the need to examine crisis-fostering conditions, along with the mechanisms of organizational weakening (Roux-Dufort, 2007). Such a perspective also analyzes the evolution of crises and how organizations react to crisis stages (Williams *et al.*, 2017).

Over the past decades, academic attention toward crisis management has gradually increased (Fallini, 2017; Pusceddu *et al.*, 2021a) due to the volume, nature, and impact of recent disasters (Doern *et al.*, 2019). Today, the unexpected outbreak of the Coronavirus pandemic (COVID-19) has considerably furthered the salience of this topic. The many lockdowns and their impact on economies worldwide have significantly contributed to unprecedented distress “with no documented equivalent in the entrepreneurship literature” (Kuckertz *et al.*, 2020: 2). Notably, the setbacks imposed by the lockdown of all non-essential businesses both limited and eliminated opportunities to generate revenue for many firms, thus fundamentally changing the way they do business (Moi and Cabiddu, 2020; Pusceddu *et al.*, 2021b). These problems are even more complicated for small and medium-sized enterprises (SMEs). Indeed, with their limited ability to overcome the involved risks and sustain costs due to the reduced business activities, SMEs, are facing complex problems related to the lack of funds and liquidity in their attempts to implement social-distancing measures and regulations in order to operate and reopen during this health emergency (Fairlie, 2020).

Despite the relevance of crisis management for SMEs, existing literature (e.g., Herbane, 2010; Kraus *et al.*, 2013) primarily targets large firms but pays less attention to smaller businesses. As a result, the manner in which SMEs transform their business strategies during unexpected events remains an exciting and unexplored research topic in business, economics, and management studies that needs a solid theoretical basis (Herbane, 2010; Kraus *et al.*, 2012; Naidoo, 2010).

The present paper attempts to fill this gap by answering the following research question: “What business strategies are adopted by SMEs during the different stages of unexpected events?” We performed a systematic review of the literature about crises in the context of SMEs (Denyer *et al.*, 2008; Tranfield *et al.*, 2003). Following the crisis-as-process perspective, we organized our findings in three main phases: crisis prevention, response, and recovery (Elliott *et al.*, 2005; Hills, 1998; Runyan, 2006; Smith, 1990).

The study contributes to extending prior literature on crisis management by investigating how SMEs may modify business strategies to address crises. It also proposes a framework that highlights the circularity of the crisis prevention, response, and recovery phases, as well as propositions that categorize the main strategies intersecting with the different phases of unpredicted circumstances. Notably, since all strategic responses are based on previous experience, the same experience can lead to several strategic responses during the crisis' various phases. Moreover, each strategic

response can affect the others. From a managerial perspective, this research supports managers and practitioners in implementing or redefining their business strategies by suggesting the most suitable strategy according to the sequences belonging to uncertainty.

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The intersection between
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and the phases of
unexpected events: a
systematic review of the
literature

2. Methodology

To identify how small businesses react in times of crisis, we conducted a systematic literature review (SLR) (Denyer *et al.*, 2008; Tranfield *et al.*, 2003). This is a replicable, scientific and transparent process (Thorpe *et al.*, 2005) that follows specific procedures designed to reduce review biases and errors (Tranfield *et al.*, 2003), thereby improving the quality of the review process and its results (Mihalache and Mihalache, 2015). Moreover, it summarizes and organizes the literature that has accumulated in a specific field (Wang and Chugh, 2014), thus providing evidence of the study's validity by replicating exact steps during the review process (Wang and Chugh, 2014).

We performed the SLR by leveraging two databases, i.e., Web of Science (WoS) and Scopus. We searched for the keywords (Crises OR crisis OR disaster* OR recover* OR resilience OR COVID* OR Coronavirus) AND ("small business*" OR "small firm*" OR "small enterprise*" OR "small organization*" OR SME OR SMEs), thus restricting the research to the business, management, accounting and economics subject areas. We focused on papers that had been published in the January 2010 - July 2020 period to capture the latest developments and trends of the topic (Danese *et al.*, 2018).

The research yielded a total of 1657 articles. After eliminating duplicates, we reduced the list of articles to 1379 titles. We proceeded with the article selection by closely reading the abstracts. We excluded papers that did not investigate business strategy changes in SMEs due to unexpected challenges and those that did not have crisis management at their core. Furthermore, we considered non-relevant papers that primarily focused on crises or/and SMEs through an exclusively advanced financial and banking perspective. The "grey literature" (i.e., books, book chapters, conference proceedings, dissertation abstracts, and working papers) was excluded. As a result, a total of 89 articles was identified. A few papers were not available in full-text, thus reducing the sample to 75 articles. Thirty-nine articles were, hence, considered to be suitable for the analysis. Following hand searching and citation tracking, 14 additional articles were selected. A final sample of 53 papers was obtained (see Appendix 1, 2, 3, 4).

3. Intersecting SMEs' business strategies with crisis phases

To provide a clear picture of how crisis events affect SMEs, we organized the business strategies into intersecting categories. These categories allow a summary of the literature that addresses this research topic. Ten SME strategies were identified across three phases: crisis prevention, response,

and recovery (Elliott *et al.*, 2005; Hills, 1998; Smith, 1990) (see Table 1). Crisis prevention investigates the concepts of mitigation and planning (Fink, 1986). Crisis response focuses on how organizations shift their resources to minimize damages to the business (Hale *et al.*, 2005). Finally, crisis recovery is when organizations “learn” from the crisis (Elliott *et al.*, 2005; Hale *et al.*, 2005; Smith and Sipika, 1993).

Tab. 1: Crisis phases and SMEs’ strategies during unexpected events

Phases	SMEs’ strategies	Issues explored	Sources
Crisis prevention	Flexible planning to be resilient against potential destructive crisis effects	SMEs focus on building a robust business to deal with crises.	Ates and Bititci (2011); Demmer <i>et al.</i> (2011); Gunasekaran <i>et al.</i> (2011); Ha <i>et al.</i> (2020); Herbane (2019); Hong <i>et al.</i> (2012); Moneva-Abadia <i>et al.</i> (2019); Thun <i>et al.</i> (2011); Vargo and Seville (2011)
	Financial resources equipment to mitigate unexpected risks	SMEs ensure they have adequate resources in their business to safeguard business management and supply chain.	Kraus <i>et al.</i> (2012); Tognazzo <i>et al.</i> (2016)
	Proactiveness to promote and anticipate changes in demand	SMEs look for opportunities to gain competitiveness. They aim to become more customer-centered and forge a strong client base.	Cassia <i>et al.</i> (2012); Demmer <i>et al.</i> (2011); Gunasekaran <i>et al.</i> (2011); Herbane (2010); Hong <i>et al.</i> (2012); Ismail <i>et al.</i> (2011); Kraus <i>et al.</i> (2012); Le Nguyen and Kock (2011); Naidoo (2010)
	Collaboration to create a sharing and open environment	SMEs find outside help through the building of deep complementary alliances, thus creating an open business environment.	Ates and Bititci (2011); Branicki <i>et al.</i> (2018); Demmer <i>et al.</i> (2011); Doern (2016); Gunasekaran <i>et al.</i> (2011); Ha <i>et al.</i> (2020)
Crisis Response	Cost minimization strategies and cash flow protection	SMEs focus on their financial resources. They reflect on which unnecessary spending to pause or cut back to protect their cash flow, cover potential absences, and generate liquidity.	Battisti <i>et al.</i> (2013); Bourletidis and Triantafyllopoulos (2014); Doern (2016); Edvardsson and Teitsdóttir (2015); Eggers and Kraus (2011); Giannacourou <i>et al.</i> (2015); Hong <i>et al.</i> (2012); Kottika <i>et al.</i> (2020); Mayr and Lixl (2019); Mendoza <i>et al.</i> (2018); Morrish and Jones (2020); Pal <i>et al.</i> (2012); Parker and Ameen (2018); Shafi <i>et al.</i> (2020); Smallbone <i>et al.</i> (2012); Thorgren and Williams (2020)
	Revenue generation strategies: operations and business model pivoting	SMEs innovate to stay top-of-mind in their existing customers’ minds, thus stimulating demand and renewing supply.	Alberti <i>et al.</i> (2018); Antonoli and Montresor (2021); Bamiatzi and Kirchmaier (2014); Battisti <i>et al.</i> (2013); Bourletidis and Triantafyllopoulos (2014); Cioppi <i>et al.</i> (2014); Dias <i>et al.</i> (2020); Doern (2016); Edvardsson and Teitsdóttir (2015); Eggers and Kraus (2011); Giannacourou <i>et al.</i> (2015); Hong <i>et al.</i> (2012); Johansen (2020); Kottika <i>et al.</i> (2020); Lado <i>et al.</i> (2013); Le Nguyen and Kock (2011); Macpherson <i>et al.</i> (2015); Madrid-Guijarro <i>et al.</i> (2013); Mayr and Lixl (2019); Mayr, Mitter, and Aichmayr (2017); Morrish and Jones (2020); Pal <i>et al.</i> (2012); Pal <i>et al.</i> (2014); Pal <i>et al.</i> (2013); Shafi <i>et al.</i> (2020); Smallbone <i>et al.</i> (2012); Thorgren and Williams (2020); Tsilika <i>et al.</i> (2020)
	Stakeholder relationship: what SMEs need others for	SMEs mobilize practical resources, strengthen or build stakeholders’ relationship, and ask for support.	Adekola and Clelland (2020); Cioppi <i>et al.</i> (2014); Dias <i>et al.</i> (2020); Doern (2016); Eggers and Kraus (2011); Giannacourou <i>et al.</i> (2015); Ha <i>et al.</i> (2020); Macpherson <i>et al.</i> (2015); Mayr and Lixl (2019); Mayr <i>et al.</i> (2017); Mendoza <i>et al.</i> (2018); Morrish and Jones (2020); Ogawa and Tanaka (2013); Shafi <i>et al.</i> (2020); Thorgren and Williams (2020); Vargo and Seville (2011)
	Dynamic approaches in small business management	SMEs use learning orientation, ambidexterity, causal, and effectual decision-making logic to ensure overall minimal disruption.	Battisti, Beynon, Pickernell, and Deakins (2019); Dolz, Iborra, and Safón (2019); Iborra, Safón, and Dolz (2019); Laskovaia <i>et al.</i> (2019); Osiyevskyy <i>et al.</i> (2020)
	Business model re-configuring: developing an innovation mindset within SMEs	SMEs accept risks and design new business models.	Doern (2016); Ha <i>et al.</i> (2020); Hong, Huang, and Li (2012); Le Nguyen and Kock (2011); Mendoza <i>et al.</i> (2018); Morrish and Jones (2020); Shafi <i>et al.</i> (2020); Thorgren and Williams (2020)
Crisis Recovery	Re-establishing stakeholder and employee relationships	SMEs re-establish stakeholder relationships, thus relying on their support.	Asgary <i>et al.</i> (2012); Doern (2016); Ha <i>et al.</i> (2020); Hong <i>et al.</i> (2012); Mendoza <i>et al.</i> (2018); Morrish and Jones (2020); Shafi <i>et al.</i> (2020); Thorgren and Williams (2020)

Source: our elaboration

3.1 The crisis prevention phase

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This first phase investigates the crisis prevention strategies that are adopted by SMEs to prevent unwanted crisis outcomes.

Crisis prevention is about mitigation and planning (Fink, 1986). During this phase, small business leaders - entrepreneurs/business owners, CEOs, and managers - and employees seek to understand how to best prepare, whether they have already experienced adversity from an unforeseen situation or not.

According to previous literature, SMEs should stay focused on: flexible planning to be resilient against potential destructive crisis effects (Herbane, 2019; Moneva-Abadía *et al.*, 2019); financial resources equipment to mitigate unexpected risks (Kraus *et al.*, 2012; Tognazzo *et al.*, 2016); proactiveness, to promote and anticipate changes in demand (Cassia *et al.*, 2012; Herbane, 2010); and collaboration, to create a sharing and open environment (Branicki *et al.*, 2018).

Flexible planning to be resilient against potential destructive crisis effects

Small businesses' preparation for the road ahead is as fundamental as their present performance when going through difficult times.

Researchers have shown that SMEs hyper-focus on contingency planning to build a robust business to deal with crises during the prevention phase (Hong *et al.*, 2012). In this regard, various studies show SMEs' need to be agile and have plans to promptly prevent unwanted crisis outcomes and immediately respond to changing landscapes (Ates and Bititci, 2011; Gunasekaran *et al.*, 2011; Herbane, 2019).

Creating a flexible organizational structure and developing a "crisis-ready" culture to facilitate resilience are essential in SMEs. By doing this, SMEs develop proactive, long-term strategic, and resilience-planning activities - such as long-track strategic record planning, crisis management plan setup, and investment in equipment infrastructures (Vargo and Seville, 2011). Scanning the external environment is necessary to detect warning signs that could prompt an impending crisis (Hong *et al.*, 2012). Furthermore, insurance purchasing becomes a foremost priority for small businesses to protect the company from financial losses, whereas an external event manifests as a crisis within the organization (Ha *et al.*, 2020; Hong *et al.*, 2012).

Fascinating insight into crisis prevention comes from solutions to strengthen the firm's capacity to focus directly on customer needs. Therefore, paying attention to socially responsible strategies (e.g., recycling and reducing emissions and waste, saving energy to achieve greater efficiency, introducing alternative energy sources, using, purchasing, or producing organic items) can restore the firm's reputation and maintain competitiveness (Moneva-Abadía *et al.*, 2019).

Financial resources equipment to mitigate the unexpected risks

One of the biggest concerns during crises is cash flow. When it comes to SMEs, in order to endure uncertain and unpredictable times (Fink, 1986; Hermann, 1963; Quarantelli, 1988), it is necessary to improve business

liquidity, thus ensuring that SMEs have adequate resources before and after unexpected situations. This action safeguards business management and the supply chain. Minimizing risky projects is necessary due to their negative interaction effect on SMEs' performance when combined with market turbulence (Kraus *et al.*, 2012). The accumulation of slack - that is, surplus resources - serves to buffer against adversity and favor the pursuit of a sustainable competitive advantage. Therefore, it is essential to accompany SMEs through unforeseen events (Tognazzo *et al.*, 2016).

Proactiveness to promote and anticipate changes the demand

Scholars argue that to contain "economic turmoil" times, SMEs look for incentives from which to gain competitiveness; they aim to become more customer-centered and forge a strong client base (Cassia *et al.*, 2012; Herbane, 2010; Kraus *et al.*, 2012; Naidoo, 2010).

Implementing an agile approach with operational - i.e., improving the current products for existing customers - and strategic capabilities - i.e., creating new markets and introducing a unique value proposition to reach new customers - significantly enhances the organization's resilience (Ismail *et al.*, 2011).

It is essential for SMEs to critically reflect on the changes in demand and trends they can anticipate. This behavior can subsequently highlight the need to find radical new pivots to reposition SMEs' product and service offering. Promoting innovative products or services to existing consumers by looking for new international markets for SMEs' trading activities makes it far easier to evolve positively and grow in the wake of a crisis (Herbane, 2010; Le Nguyen and Kock, 2011).

Collaboration to create a sharing and open environment

Research has established that finding outside help by building meaningful complementary alliances - with loyal customers, suppliers, employees, and competitors - helps create an open business environment (Ates and Bititci, 2011; Branicki *et al.*, 2018; Ha *et al.*, 2020).

Collaboration is an excellent practice for the following unexpected challenges, a resource of resilience, and a critical small business value to limit the adverse consequences of unforeseen situations. Asking for support from SMEs networks and creating connections among teams is crucial. This approach involving everyone around the organization sustains mutual side knowledge sharing and provides immediate effect expertise in the areas where SMEs lack the required coping skills to solve the crisis. Creative partnership implementation increases innovation, efficiency, and flexibility in SMEs. Creating an open and transparent culture within the small business by encouraging organizational members to report potential problems and challenges could help develop an organization's anticipation mindset.

Therefore, we propose that:

Proposition 1a (P1a): The adoption of strategies such as flexible planning during the crisis prevention stage increases SMEs' ability to mitigate unwanted crisis outcomes.

Proposition 1b (P1b): The adoption of strategies such as financial resources equipment during the crisis prevention stage increases SMEs' ability to mitigate unwanted crisis outcomes.

Proposition 1c (P1c): The adoption of strategies such as proactiveness during the crisis prevention stage increases SMEs' ability to mitigate unwanted crisis outcomes.

Proposition 1d (P1d): The adoption of strategies such as collaboration during the crisis prevention stage increases SMEs' ability to mitigate unwanted crisis outcomes.

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3.2 The response phase

Researchers have considered the response phase significant, as the decisions that are made in this timeframe can mitigate the crisis' destructive effects (Elliott *et al.*, 2005).

To navigate challenges and fight adversity, SMEs try to be open to change - to upskill and re-invent their business approach. Although it is not always easy for SMEs to go through a crisis, they can rapidly convert it to a massive opportunity if they are able to handle these events in stride by "embracing change" in their ways of performing.

In this phase, significant focus is directed towards cost minimization strategies and cash flow protection (Eggers and Kraus, 2011; Smallbone *et al.*, 2012), revenue generation strategies - operations and business model pivoting (Macpherson *et al.*, 2015; Morrish and Jones, 2020), stakeholder relationships (Doern, 2016; Mayr *et al.*, 2017), and dynamic small business management (Battisti *et al.*, 2019; Osiyevskyy *et al.*, 2020).

Cost minimization strategies and cash flow protection

In the crisis response stage, earnings are considerably put at risk (Runyan, 2006), and SMEs are required to have a deep understanding of their financial resources.

On the one hand, during unpredicted events, financial risks (i.e., risk of default, business failure, bankruptcy) increase and, on the other hand, profit margins tend to decrease. Therefore, having adequate resources to navigate small businesses through a crisis, thus minimizing costs and generating revenues, is indispensable. Numerous studies highlight the importance of clarifying business priorities to identify which types of spending to pause or cut back to protect cash flow, cover potential absences, and generate liquidity (Battisti *et al.*, 2013; Eggers and Kraus, 2011; Smallbone *et al.*, 2012). A great place to start from is related to human resources - employees' wages and emoluments. These expenses significantly weigh on SMEs' balance sheets. Therefore, in times of uncertainty, they are often reduced or cut (Battisti *et al.*, 2013; Mayr and Lixl, 2019; Smallbone *et al.*, 2012).

To ensure that they can weather the tough times ahead, small business leaders share tough instant decisions that impact people's lives. In doing so, they contribute to keeping cash in the company while providing a timely defense against challenging events and limiting the crisis' adverse consequences. When revenues decrease, SMEs optimize their workforce

by maintaining the most operationally talented employees and laying off its non-productive workforce to ensure business operation efficiency (Hong *et al.*, 2012; Thorgren and Williams, 2020). SMEs transparently communicate with organizational members to make them understand the rationale of the business decision. They update employees on what is happening inside the organization even though it can be challenging for small business leaders to guarantee secure future scenarios.

When SMEs expect revenue to rebound soon, flexible furlough schemes (i.e., temporary leave without pay and reduction of working hours in accordance with the established law) might be the best option to enable SMEs to control cost reduction (Battisti *et al.*, 2013; Smallbone *et al.*, 2012). Interrupting personnel recruitment in the company and gradually reducing salary are other approaches to better managing small business revenues (Kottika *et al.*, 2020; Thorgren and Williams, 2020).

Small business leaders focus on their core values under unexpected circumstances, allocating financial resources to their most profitable assets. From this perspective, seeking to reduce loss-making and risky investments in order to focus on more profitable ones constitutes a wise attitude (Mayr and Lixl, 2019; Parker and Ameen, 2018).

Reasonable cash reserves in the company and available government grants are the best funding for SMEs to take advantage of and inject internally financial resources in the attempt to buffer against adversity and mitigate some of the involved risks (Doern, 2016; Morrish and Jones, 2020). Indeed, due to current economic volatility and business financial constraints, external debt (i.e., bank loans) is highly discouraged since SMEs encounter difficulties in paying it back (Smallbone *et al.*, 2012).

Revenue generation strategies: operations and business model pivoting

Revenue generation strategies concern the multiple efforts implemented by SMEs to be at the forefront of responding to a crisis, thereby seeking new opportunities in the marketplace.

When SMEs' leaders make mistakes in managing financial resources wisely, re-evaluating, or shifting the current business model and the value proposition, thinking outside the box and adapting while remaining anchored to the business' core values are meaningful methods to achieve business success.

Scholars strongly emphasize repositioning and value proposition flexibility to decrease costs and boost sales (Lado *et al.*, 2013; Macpherson *et al.*, 2015; Mayr and Lixl, 2019; Tsilika *et al.*, 2020).

Flexibility is the hallmark of successful small businesses, leading to a new focus in SME's corrective actions and pivoting (Hampel *et al.*, 2019) and therefore moving away from the organization's current strategy in order to pursue a new direction. This approach aims to create a unique offer for SMEs to proactively drive change - i.e. shifting business thinking from surviving to a crisis to thriving. It is, therefore, necessary to generate an offer that stands out from others on the market, thus implying an absolute added value and revenue generation. The market is moving towards SMEs' operations so staying aligned with and exploring new revenue streams is critical.

Investing in customers facilitates the building of long-life loyalty and trust. Knowing the clients enhances revenue generation. This entails being passionate about listening to them to understand their specific troubles, empathize, and feel the urgency to accommodate their in-depth needs. Being fast and centered around meeting customers' (physiological, safety, love/belonging) needs is a key ingredient. Quickly pivoting SMEs' offering, repositioning, and providing a greater range of products or services that are likely to break into the market and remain relevant in the "new normal" is an excellent method to fill the needs gap (Macpherson *et al.*, 2015; Madrid-Guijarro *et al.*, 2013).

Appropriately strategizing and analyzing what markets SMEs will enter is part of an innovation mindset. New perspectives, habits, and priorities change consumers' buying behavior. When SMEs know their market's nuances, they can easily navigate throughout changing periods and attract different customer segments. Blue-sky thinking (Wrigley *et al.*, 2016) enables SMEs to design new effective solutions for the market they believe are approaching. Consumers do not need perfect products, especially when crises unfold, so sometimes the right solution is to provide them with small adjustments to the products they are familiar with (Bamiatzi and Kirchmaier, 2014). SMEs need to be passionate. Introducing customized products or services is a way to face the rapid evolution of consumers' behavior (Bamiatzi and Kirchmaier, 2014). In order to be persuaded to buy, customers need disposable income. Cheaper and inferior products and services can suit cash-strapped audiences' requirements (Bamiatzi and Kirchmaier, 2014).

The present literature analysis shows how investments in innovation related to value proposition and the production process are closely linked and often complementary (Bamiatzi and Kirchmaier, 2014). Process innovation is one of SMEs' most defining characteristics and improves the production chain's operational efficiency and quality (Antonoli and Montresor, 2021; Macpherson *et al.*, 2015; Madrid-Guijarro *et al.*, 2013; Morrish and Jones, 2020; Plechero, 2018; Tsilika *et al.*, 2020). It helps SMEs bring money into the business, remain competitive, and meet customer demands.

For some SMEs' operations, outsourcing is an alternative to manage adversity and sustain growth (Edvardsson and Teitsdóttir, 2015; Pal *et al.*, 2012). SMEs hyper-focus on the business activities they are good at, to which they delegate the most time and high resource allocation tasks. Outsourcing helps to keep costs under control and increase efficiency.

Once the newly adapted products and services are created, internationalization strategies facilitated by globalization's powerful impact make the brand known outside national borders, thus reducing risks when the domestic and international economy change (Bamiatzi and Kirchmaier, 2014; Battisti *et al.*, 2013; Eggers and Kraus, 2011; Mullaeymeri *et al.*, 2015).

Finally, researchers stress how budgeting funds for external marketing communication channels - such as social media, websites, catalogs, and public relations - should be at the forefront when reaching out to SMEs' target audience to ensure on-brand messaging and brand identity (Bamiatzi and Kirchmaier, 2014; Eggers and Kraus, 2011; Lado *et al.*,

2013). In light of the crisis, communicating means informing consumers about organizational values - what the business stands for and what the SMEs' employees take pride in, gauging how the business is performing, presenting changed products and services, and provoking customers' response to purchase.

Stakeholder relationships: what SMEs need others for

During the heightened state of a crisis, SMEs need to mobilize practical resources. Regardless of cuts in the payment chain, when critical situations wreak havoc on small businesses, it is strictly necessary to strengthen or build their relationship with stakeholders - for example, suppliers, clients, the surrounding community, organizational members, other businesses - and ask for support (Doern, 2016; Eggers and Kraus, 2011; Macpherson *et al.*, 2015; Mayr *et al.*, 2017; Morrish and Jones, 2020; Ogawa and Tanaka, 2013). Communication during crises covers a central role: when difficult news need to be shared, leadership is necessary in ensuring honesty and clarity towards employees and general stakeholders. Thus, extra support, reassuring, and encouraging SMEs' staff (Ha *et al.*, 2020) is essential.

SMEs genuinely consult with everyone they think can help and engage in team building. Bilateral expertise, skills, and resource sharing are great methods to devise new strategies and seize business opportunities. SMEs need to be unashamed in seeking help and accepting their need for collaboration. Maintaining stakeholder relations is part of the roadmap that favors establishing an innovative business culture that is amenable to communicating and listening to others, being knowledgeable about what other people know, and implementing what they have learned. Furthermore, by facing mutual difficulties, cooperation can provide more favorable terms for vendors' and suppliers' agreement renegotiations, thus ensuring loss minimization (Mayr and Lixl, 2019; Thorgren and Williams, 2020).

Dynamic approaches in small business management

During periods of uncertainty and turbulence in the small business context, another aspect concerns the development of dynamic and reactive behavior.

Learning orientation (Battisti *et al.*, 2019), defined as "the ability of an organization to create, transfer, and integrate knowledge and modify its behavior to improve performance" (Altinay *et al.*, 2016: 872), helps SMEs sustain their performance. In particular, it encourages businesses to constantly challenge the status quo and strive for constant enhancement, leading to a more versatile and adaptable way of doing things (Altinay *et al.*, 2016).

In improving SME behaviors, scholars have also identified ambidextrous strategies - leveraging existing assets, knowledge, and competencies (exploitation) or trying to develop new ones (exploration) (Osiyevskyy *et al.*, 2020) - as successful elements to best react to tough times and ensure minimal overall disruption.

From a strategic management perspective, to support the competition, scholars highlight the importance of continually focusing on causal and

effectual decision-making logic approaches (Laskovaia *et al.*, 2019). In particular, while the emergent nature of effectual logic allows businesses to make incremental investments that help them step forward and adapt to changing circumstances, causal decision-making is considered a collection of highly reflective and rational practices that reinforce prediction and strategic planning (Laskovaia *et al.*, 2019).

Accordingly, we propose that:

Proposition 2a (P2a): The adoption of strategies such as cost minimization and cash flow protection during the crisis response stage increases SMEs' ability to navigate unforeseen challenges and fight adversity.

Proposition 2b (P2b): The adoption of strategies such as revenue generation - operations and business model pivoting - during the crisis response stage increases SMEs' ability to navigate unforeseen challenges and fight adversity.

Proposition 2c (P2c): The adoption of strategies such as stakeholder relationships in small business management during the crisis response stage increases SMEs' ability to navigate unforeseen challenges and fight adversity.

Proposition 2d (P2d): The adoption of strategies such as dynamic approaches in small business management during the crisis response stage increases SMEs' ability to navigate unforeseen challenges and fight adversity.

3.3 *The recovery phase*

The third phase focuses on understanding the recovery strategies adopted by SMEs in the aftermath of unexpected challenges.

During the post-crisis stage (Smith, 1990), SMEs review/reconsider all the measures they wish they had taken before the unpredicted event and therefore modify the organization structure and implement preventive action items for the future (Doern, 2016; Le Nguyen and Kock, 2011).

Turning "learning" (Elliott *et al.*, 2005; Hale *et al.*, 2005; Smith and Sipika, 1993), in the sense of transforming business behaviors (Pauchant and Mitroff, 1992) into innovative actions, is essential in going back to the basics. Nevertheless, the learning approach within SMEs is often limited in a more practical sense (Doern, 2016). One reason consists in the perceived lack of control and limited ability to change within small businesses (Herbane, 2010).

Elaborating upon previous studies, the areas on which SMEs should stay focused during this crisis containment process can be broken down into business model re-configuring (Morrish and Jones, 2020) and the re-establishment of stakeholder and employee relationships (Doern, 2016; Hong *et al.*, 2012).

In this stage, the literature highlights a common trend adopted by SMEs in spotting opportunities to do things differently and being more open about encouraging a risk-taking culture (Morrish and Jones, 2020).

The most prominent feature of a crisis consists in sparking uncertainty and triggering volatility in the marketplace (Fink, 1986; Hermann, 1963; Quarantelli, 1988). Investing in resources takes time and energy. Not all SMEs' recovery investments will necessarily be compensated. Sitting back and doing nothing while being constrained does not lead to game-changing solutions. Positive adaptation is more likely to carry small businesses through difficult times and drive the business into the future.

Scholars have shown how SMEs revisit their insurance policies (Doern, 2016; Ha *et al.*, 2020), diversify their product-service offer, develop new business models, and guide the organization to the other side of their current trouble (Morrish and Jones, 2020).

SMEs' primary objective is to achieve organizational goals - i.e., delivering, creating, and capturing value. Nevertheless, it may seem like massive undertaking, innovating and experimenting are essential in adapting to new situations and potentially develop unexpected and more effective ways of doing business. In this regard, some SMEs have made fast, agile moves from repurposing their target market to a complete shift in production lines (Shafi *et al.*, 2020). Moreover, they have tried to invest in side businesses (Morrish and Jones, 2020), despite the possibility that the new business will not be successful. SMEs' behavior is beyond a classic situation where they would have acted more deliberately. SMEs act in this bold way with the only attempt to recover and get out of the crisis. Thus, to stay in balance: having a payoff that exceeds the expenses.

Several scholars have demonstrated how SMEs review their business model distribution channels to reach out to their target customer segments and deliver their value proposition (Morrish and Jones, 2020). Being strategically agile (Doz and Kosonen, 2008; Weber and Tarba, 2014) is considered one of the primary features to develop innovative ideas (Weber and Tarba, 2014) in changing scenarios. When the COVID-19 pandemic unfolded globally, SMEs were forced to adapt, thus changing the ways they perform. SMEs cannot afford to wait to innovate. In the "new normal", it is vital to continue learning methods that are better suited to changing environments and continuously adaptations. When an unexpected event makes the physical location shut down, striving for positive adaptation, implementing an active response, and accelerating problem-solving is fundamental for SMEs to ensure business continuity. By enhancing their decision-making boundaries, opportunity seeking SMEs shift relatively quickly away from a distribution channel that is no longer direct and physical, but rather virtual and online (Shafi *et al.*, 2020; Thorgren and Williams, 2020). Leveraging technology in the best way possible enables SMEs to rethink how they deliver services. More specifically, this behavior responds to a particular need of the moment - a temporary practice born out of necessity - in the course of a recovery phase that SMEs could maintain in the long term period. This action requires adopting a new

and robust vision for small businesses. One example is delivery service to customers' homes to rebuild business operations and reopen while considering a new normal ongoing situation (Shafi *et al.*, 2020; Thorgren and Williams, 2020) where conditions are not yet those of the past. A crisis can therefore become a catalyst to bolster creativity and resilience, thus pursuing new business growth successfully.

Difficult situations require new ways of doing things. Nevertheless, there is no need to wait to start innovating. Companies understand how essential it is to humanely and empathically approach customers following unplanned and unexpected events. SMEs' aim is to enhance the product's visibility and communicate closeness to the consumer throughout the situation that is being experienced. Pushing critical messaging therefore takes on an important role.

Re-establishing stakeholder and employee relationships

Designing new business models and adapting them to changing situations involves re-establishing stakeholder (i.e., community, suppliers, customers, and employees) relationships and relying on their support (Doern, 2016; Hong *et al.*, 2012; Morrish and Jones, 2020).

Collaboration is considered an inner strength to supplement deficiencies (i.e., lack of funding) and provides SMEs with the extra energy they need to navigate critical occurrences. Drawing upon leadership teams ensures a sense of community where everyone can benefit from the new knowledge. All small businesses' tools and expertise, combined with those of the people they have access to, enable the fostering of new ideas and the implementation of creative solutions.

After difficult times, the perceived loss of control over future scenarios may lead employees to explore other work opportunities, or business leaders may initially consider downsizing to wrest control from the current ambiguous situation. Hiring capable staff and retaining old employees becomes extremely hard. Nevertheless, SMEs cannot stop investing in human resources. In this regard, smart and exciting insights come from recovery plans for rehiring, establishing personnel funds (Ha *et al.*, 2020; Hong *et al.*, 2012), and training personnel in disaster response (Ha *et al.*, 2020).

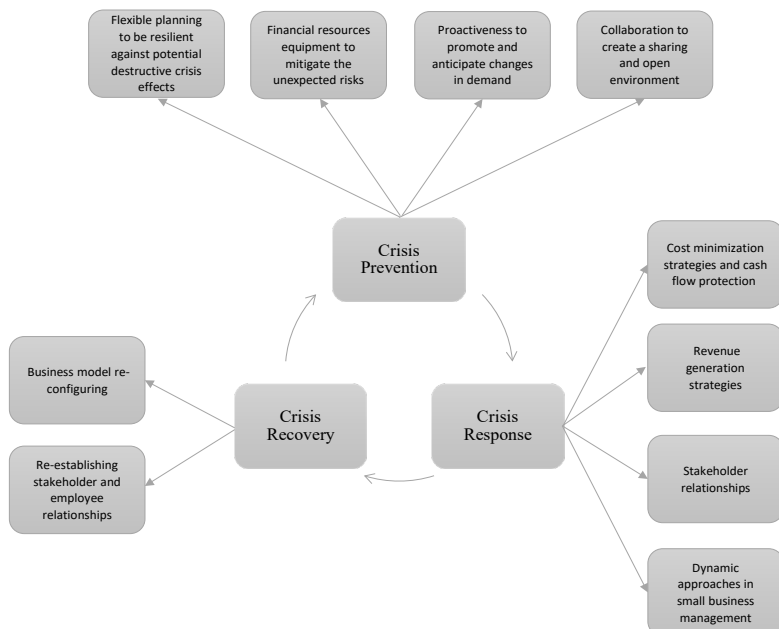
Figure 1 provides a visual summary of our framework, which highlights the circularity and the intersection of the prevention, response, and recovery crisis phases with small business strategies.

Hence, we state that:

Proposition 3a (P3a): The adoption of strategies such as business model re-configuring during the crisis recovery phase deepens learning relevance when bouncing back from unexpected challenges and increases the likelihood of breakthrough results.

Proposition 3b (P3b): The adoption of strategies such as the re-establishment of stakeholder and employee relationships during the crisis recovery phase deepens learning relevance when bouncing back from unexpected challenges and increases the likelihood of breakthrough results.

Fig. 1: The circular event framework of SMEs' business strategies in a time of crisis



Source: our elaboration

4. Discussion and theoretical contribution

Despite the vast body of available knowledge on crisis management, research on this topic regarding the context of SMEs is still in its infancy. By elaborating prior crisis management literature, this study contributes to extend current research in meaningful ways. First of all, research on small business strategies aiming at facing unexpected situations was fragmented across different fields. Previous studies have mainly analyzed specific aspects or outcomes related to facing such conditions of uncertainty (Doern, 2016; Morrish and Jones, 2020). This work contributes to providing a more solid theoretical basis, thus identifying the features that, collectively and in an integrative manner, define SMEs' strategies across the different stages of a crisis event. Furthermore, we have defined a framework of strategic responses to a crisis in the context of SMEs that better aligns with the proper definition of crisis as an unexpected, ever-changing event (Bazerman and Watkins, 2004; Fink, 1986; Hermann, 1963; Quarantelli, 1988; Weick *et al.*, 1999).

Secondly, we contributed to extending prior literature by developing a three-stage circular event theoretical framework on SMEs' strategies when coping with crises, thus differentiating such strategies across the phases of crisis prevention, response, and recovery.

Crisis prevention. Previous research on the crisis prevention process has shown that preparing for unforeseen situations is a key to positive results

(Elliott *et al.*, 2005; Fink, 1986; Hale *et al.*, 2005; Quarantelli, 1988; Smith, 1990). In particular, the effectiveness of an organization's crisis response depends, to a certain degree, on the amount of preparation it conducted before the crisis (Pearson and Clair, 1998). By extending prior literature, we have generated new insights on the link between the prevention phase and strategic behaviors. We specify that, in the crisis prevention phase, the four main strategies that could increase SMEs' capacity to mitigate and prevent unwanted crisis outcomes include: fostering ongoing and intensive planning activities to enhance SMEs' flexibility and adaptability to shape destructive crisis effects (Herbane, 2019; Moneva-Abadia *et al.*, 2019), the equipment of financial resources to mitigate risks involved in a crisis (Kraus *et al.*, 2012; Tognazzo *et al.*, 2016), proactive actions to promote and anticipate changes in demand (Cassia *et al.*, 2012; Herbane, 2010), and collaboration (Branicki *et al.*, 2018).

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Crisis response. Earlier studies defined the crisis response phase as significant since the choices that are made in this timeframe can minimize the crisis's disruptive effects (Elliott *et al.*, 2005). By improving prior literature, we suggest that four other strategies increase SMEs' ability to navigate unpredicted challenges and fight adversity during the crisis response phase: cost minimization and cash flow protection (Eggers and Kraus, 2011; Smallbone *et al.*, 2012), revenue generation - operations and business model pivoting (Macpherson *et al.*, 2015; Morrish and Jones, 2020), stakeholder relationships (Doern, 2016; Mayr *et al.*, 2017), and dynamic approaches in small business management (Battisti *et al.*, 2019; Osiyevskyy *et al.*, 2020).

Crisis recovery. When analyzing the post-crisis stage (Smith, 1990), prior scholars argue about "learning" (Elliott *et al.*, 2005; Hale *et al.*, 2005; Smith and Sipika, 1993) in terms of transforming business behaviors (Pauchant and Mitroff, 1992) into innovative actions in order to go back to business as usual. Nevertheless, the learning approach is often limited within SMEs (Doern, 2016) due to their perceived lack of control and limited capacity to change in small businesses (Herbane, 2010). By extending previous studies, we have sustained that during the recovery phase SMEs that concentrate on business model re-configuring - i.e. developing an innovation mindset within SMEs - (Morrish and Jones, 2020) and the re-establishment of stakeholder and employee relationships (Doern, 2016; Hong *et al.*, 2012) foster their recovery from unexpected challenges and the likelihood of breakthrough results.

Our final contribution is related to the circularity of our framework. While previous literature has considered crisis management strategies more sequential than circular (i.e. focusing on the event's occurrence rather than the intersection and effect that each phase has on subsequent ones), this paper contributes to existing literature highlighting the circularity of the crisis prevention, response, and recovery phases. As illustrated in figure 1, the strategic responses that are implemented during the phases of the crisis - prevention, response, and recovery - have separable effects and interact with one another. All the strategic responses develop through prior

experience; therefore, the same experience may contribute simultaneously to different strategic responses in the course of the crisis's different phases. Moreover, each strategic response may affect one another. During the prevention phase, the strategic responses affect the development of management responses by influencing the recovery phase and how managers interpret and exploit it when a new crisis occurs.

5. Managerial implications

The present study provides significant managerial insights on SMEs' efficient crisis management strategies. This is a salient topic because of the current challenging times due to the COVID-19 pandemic.

More specifically, this research increases SMEs managers' and practitioners' awareness of efficient business strategies to cope in fast-changing business scenarios where unexpected and adverse events can threaten organizational goals. Practitioners should recognize the benefits of correctly implementing a crisis-ready culture when crises strike.

Notably, a crisis is an evolving circumstance, that is, an event that continuously evolves. Crisis management is an ongoing process that must be carried out throughout the company's life. As a result, it is fundamental to understand the importance of continuously implementing up-to-date strategies to improve SMEs' performance effectiveness and ensure business continuity. More importantly, these strategies will be cyclically repeated within the company through a system that operates continuously in which the company cannot afford to underestimate any step.

Moreover, our framework could help managers develop a "crisis ready" mindset within SMEs to emerge in turbulent, unpredictable, and competitive business landscapes. For instance, during the crisis prevention phase, the former will have to implement actions to prevent a possible crisis from jeopardizing the business system (e.g., make sure they have enough financial resources to prevent changes in consumer demands). Then during the crisis response phase, managers will have to avoid crystallizing their business model. It does not matter if the latter has always worked flawlessly. Crisis changes circumstances and people, and it is essential to adapt business management to new consumers' needs. Finally, in the crisis recovery phase, managers will have to take advantage of what they have learned during the crisis prevention and response phases to restore the company to its original functioning.

Thanks to the proposed framework, we tried to understand not only how SMEs may adjust their strategies in the different moments of a crisis (pre, during, and post-crisis), but, more importantly, to what strategies could be most suitable according to the cyclic, different, specific moments related to emergency situations. The findings of this study may provide remarkable and useful insights for managers and practitioners to foster resilience in competitive and turbulent marketplaces, by understanding which strategies could be more suitable according to the specific phases of distress (i.e., crisis prevention, response, and recovery) (Elliott *et al.*, 2005; Hills, 1998; Smith, 1990). Another critical lesson that managers could learn

from this study is that implementing an integrated, strategic crisis-action plan with speed and resourcefulness is fundamental in reducing chaos and accelerating decisions. They will have to plan for the days preceding an unexpected event and an extended period of uncertainty.

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6. Limitations and future research

Given the growing necessity to understand SMEs' business strategies during the phases of unexpected events, this study adopted a clear and rigorous literature review approach based on a careful selection of journals to advance current knowledge of this topic. While these findings rely on a rigorous and reliable systematic literature review to extend knowledge in an up-and-coming research area, we acknowledge that this research has some limitations that may be addressed by future research.

Notably, we only focused on articles that satisfied stringent quality and content criteria (e.g., the use of keyword "SMEs"). As a result, we excluded some SMEs-related studies and books (Danese *et al.*, 2018) and considered non-relevant papers that primarily focused on crises or/and SMEs through an exclusively advanced financial and banking perspective. We concentrated on peer-reviewed publications and excluded unpublished research, results presented in book chapters, and conference findings (Nolan and Garavan, 2016). Our analysis also suffers from certain common SLR flaws, such as the omission of relevant studies that could have impacted the study's creativity and innovation (Easterby-Smith *et al.*, 2010; Wang and Chugh, 2013).

By extending knowledge on this nascent line of inquiry, future studies could further deepen and explore additional strategies that could be employed to conceptualize crisis response strategies across different stages.

Furthermore, future studies could extend this field through empirical research by examining what happens in a specific sector when companies need to change their business strategies at a given time during a crisis and testing the proposed framework to validate it effectively. With reference to a financial-level research perspective, future research avenues could investigate specific aspects related to the turnaround and impact of financial resources on unexpected risk.

Finally, starting from the paper's theoretical propositions, future studies could also deepen the impact of identified strategies on SMEs' competitive performance during the different phases of a crisis.

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Selected papers

Accessibility and social inclusion: an empirical investigation on the adoption of World Wide Web Consortium guidelines on corporate websites

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Abstract

Frame of the research: The research focuses on the web accessibility practices of corporate websites. These practices are part of corporate sustainability actions.

Purpose of the paper: To assess compliance with the principles of the social inclusion of disabled users, the study investigates the adoption of accessibility requirements on the sustainable firms' corporate websites.

Methodology: A content analysis was conducted to identify the application of the World Wide Web Consortium (W3C) guidelines to the websites of 311 firms classified in the Dow Jones Sustainability World Index 2018. Data were collected from July to December 2019.

Findings: Results show that most corporate websites are poorly compliant with the accessibility guidelines, although some sectoral and geographic differences emerge. The study shows that compliance with W3C standards is associated with both the belonging to different business activities and the geographical origin of companies.

Research limits: The adoption of the content analysis method implies the typical limits associated with the subjective evaluation of researchers. The sample of firms examined may be expanded in future investigations, in compliance with the equitable distribution of companies regarding sectors and geographical areas.

Practical implications: Results allow managers and consultants of corporate digital communications to evaluate and improve corporate performance relating to accessibility practices on websites. Access to digital content and services is an indispensable requirement for implementing sustainability actions, capable of increasing social legitimacy and corporate reputation and developing disabled users' engagement.

Originality of the paper: The study constitutes a first step in a line of research not yet investigated. The paper contributes to the debate on online accessibility for disabled users, providing the first empirical evidence on international guideline adoption by sustainable firms.

Key words: accessibility; inclusion; sustainability; W3C; corporate website

1. Introduction

Accessibility to digital content and tools on the web, aimed at avoiding any form of discrimination resulting from a disability and ensuring the social inclusion of all audiences (Nielsen, 2000; Adam and Kreps, 2009; Coleman *et al.*, 2016), represents a topic strongly anchored to corporate

sustainability (Ball *et al.*, 2005; Gould *et al.*, 2020). In fact, to achieve sustainable development and obtain social legitimacy (Fernando and Lawrence, 2014; Luo *et al.*, 2015), firms must promote a corporate culture based on social inclusion to favor the complete integration of disabled people in business dynamics. By adopting socially responsible behavior, the company can gain trust and establish stable relations with stakeholders, improving its reputational capital (Fombrun and van Riel, 2004).

To promote the social inclusion of individuals with disabilities, companies have to ensure accessibility to digital content on their corporate websites (Sanil and Ramakrishnan, 2015). The website represents the main digital communication tool through which firms convey corporate information (values, commitment, activities, performance) and facilitate stakeholder engagement (Friedman and Miles, 2006; Viglia *et al.*, 2018). The corporate website contributes to the development of disabled users' participation and allows for a positive interaction with the digital environment (Anderberg and Jönsson, 2005; Baroni and Lazzari, 2013).

To be accessible, a website needs to adapt to the international technical standards set by the Web Content Accessibility Guidelines (WCAG) issued by the World Wide Web Consortium (W3C; an international organization created with the aim of developing standards for the web) Web Accessibility Initiative (the section that deals with spreading accessibility culture on the web). Adoption of these criteria allows websites to provide services and share information that can be used by all users, thanks to the assistive technologies that allow alternative content and customized configurations.

Despite the growing interest in social inclusion principles and the increasingly current national and international debate on web accessibility regulations (De Andrés *et al.*, 2010; Adelopo *et al.*, 2012; Coleman *et al.*, 2016), most online organizations in the private sector still fail to comply with accessibility standards (Leitner *et al.*, 2016). Indeed, although awareness of accessibility issues is critical to meet disabled users' needs, there appears to be a lack of understanding about reasons for applying specific accessibility elements and knowledge of how firms should implement them effectively (Brophy and Craven, 2007; Kuzma *et al.*, 2007). Moreover, empirical surveys aimed at investigating compliance with accessibility requirements on websites of sustainable firms are still limited in both the academic and the business communities. This paper intends to fill this gap through an exploratory study investigating the presence of W3C standards on the websites of 311 firms classified in the Dow Jones Sustainability Word Index (DJSWI) 2018, a global index that identifies the main sustainable companies present worldwide. These firms are located in different geographical areas and conduct different business activities.

In line with the purpose of the research, the paper is organized as follows. The conceptual background will deal with web accessibility regulations, social inclusion, and the link with corporate sustainability, as well as the W3C standards. Next, the paper will describe the methods and empirical survey. Subsequently, the discussion of the exploratory study results will provide insights for business digital communication managers and consultants.

2. Conceptual background

2.1 *The right to accessibility for disabled people: between inclusion and sustainability*

The inclusion of disability is part of corporate sustainability practices (Quaddus and Siddique, 2011; Gould *et al.*, 2020). A firm can be defined as sustainable if it respects principles of corporate social responsibility (CSR) and ensures the right balance between economic performance, environmental protection and social progress: the “3Ps”-profit, planet, and people (Savitz and Weber, 2006). In particular, the people dimension concerns a firm’s ability to respect the expectations of its stakeholders and embraces issues relating to various areas of social sustainability, including respect for human rights and opportunities and non-discrimination principles. Indeed, the company needs to obtain legitimacy by people also belonging to the most disadvantaged categories, who increasingly demand the right to be informed about corporate actions (Greenwood, 2007; Luo *et al.*, 2015; Gambetti *et al.*, 2017).

In this respect, referring to the principles of independence, equality and participation, the United Nations Convention on the Rights of Persons with Disabilities considers as unconditional the right to accessibility, which expresses “the extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities to achieve specified goals in a specified context of use” (Persson *et al.*, 2015, p. 524).

Accessibility can be considered the “zero level” of democratic guarantee (Silvestri and Ducci, 2004; Coleman *et al.*, 2016). Information and communication technologies (ICTs) play an important role, since they represent a relevant support tool for accessibility and social inclusion if designed according to the requirements of fair use (Adelopo *et al.*, 2012). The goal of the web accessibility standards is to help make the web more accessible for people with disabilities (Elcessor, 2010). Accessibility opens doors to information for users with difficulties. It supports the independence of disabled individuals, helping them to participate in day-to-day activities like online shopping, entertainment and reading news. In this respect, accessibility guidelines devolve a more inclusive cultural and political sphere online.

In particular, access to ICTs for people with disabilities must be based on the web eQuality standards, adopted to ensure compatible use of web content for people with sensory (blind and deaf), motor skill (handicaps in the use of hands), and cognitive disabilities (Maretti, 2003). Each disability category presents problems of varying complexity that require specific digital solutions to allow access to corporate information.

ICTs promote “inclusive” and “participatory” processes of stakeholder engagement that can significantly contribute to improving the sustainability of corporate decisions (Friedman and Miles, 2006; Viglia *et al.*, 2018). A truly sustainable organization inevitably tends to dialogue with all stakeholders, without any discrimination, to involve them in company dynamics (Porter and Kramer, 2011; Golinelli and Volpe, 2012; Vollero

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et al., 2019). The development of a sustainable relationship between the firm and its audiences, based on the principle of social inclusion, appears connatural to the concept of corporate sustainability (Mathur *et al.*, 2008; Prado-Lorenzo *et al.*, 2009). In fact, the correct and effective management of accessible content on the web has an impact on a company's long-term strategy (Lindahl, 2006) and is a part of CSR practices (Martínez *et al.*, 2014).

However, if information technologies are designed without considering the accessibility needs of people with disabilities, they can be configured as tools of social exclusion (Goggin and Newell, 2003; Seymour, 2004). Therefore, the issue of access to ICT is framed in the context of the right to information and communication (Zaccaria and Valastro, 1998) and the broader question of the digital divide, which highlights and denounces the inequalities deriving from the impossibility of access to digital content (Sartori, 2006; Bentivegna, 2009; Van Dijk, 2020).

From this awareness derive international and national regulations on accessibility, intended to ensure equality of access to information and usability of digital content for all users, avoiding marginalization factors (Baroni and Lazzari, 2013). In many countries, websites and mobile applications must comply with web accessibility standards required by various regulations (such as EN 301 549 in Europe, the ADA and Section 508 in the United States of America, and the AODA in Canada), following the international WCAG of the W3C. Regulations related to the accessibility of information content involved public organizations, in a first phase (Di Giorgi and Bargellini, 2006). Several studies show that few government websites in Europe and the US are fully compliant with WCAG standards (Kuzma *et al.*, 2009; Martínez *et al.*, 2014). There are also significant gaps in accessibility in social networks (Lee *et al.*, 2014).

In some provinces of Canada, accessibility standards apply to both public and private entities, e.g. AODA. In Europe, the possibility of expanding the set of organizations obliged to comply with the accessibility requirements was encouraged by Directive (EU) 2016/2102. This directive, while constituting a discipline on the accessibility of public organizations' websites and mobile applications, allows Member States to extend its application to private organizations in sectors, such as health, childcare, social inclusion and social security, transport services and electricity, gas, heat energy, water, electronic communications, and postal services. An advance in this direction was made by Directive (EU) 2019/882, which establishes economic operators' compliance with specific accessibility requirements for websites for products and services (relating to transport, e-commerce, media and the financial sector) provided to consumers starting from June 2025. From that time, no inaccessible product or service can be placed on the European market.

In the context of national laws, there has been a process of transposition and implementation of these regulations. In Italy, Law 4/2004 (Stanca Law) represents an important milestone in affirming the right to accessibility in terms of the inclusion of disadvantaged users, guaranteeing a minimum level of accessibility to public administration websites, and in the publication of specific guidelines based on the WCAG. The launch in 2020

of a substantial reform of the law partially anticipated the transposition of EU Directive 2019/882, which included large companies in the private sector among the recipients of the legislation. Article 29 of the Simplification Decree (Legislative Decree 76/2020 converted with amendments by Law 120/2020) provides for the extension of accessibility obligations defined by the Stanca Law to private subjects with a specific average turnover (over five hundred million euros in the last three years of activity) that offer services to the public through websites or mobile applications.

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2.2 Accessibility on corporate websites: W3C standards

Among the tools most used by firms, a particularly important role is assumed by the website, which allows a direct and immediate explanation of a company's value statements and activities (Castelo Branco *et al.*, 2014; Sanil and Ramakrishnan, 2015; Siano *et al.*, 2016). The website also offers organizations greater flexibility in managing corporate content, with the possibility of continual updates (Williams and Pei, 1999).

To ensure effective online communication with users with skill deficits, website ergonomics is an important issue (Mich *et al.*, 2003; Chevalier and Kicka, 2006). It involves the creation of an easy-to-use interface and supports an adequate use of content. The first requirement to allow the development of an inclusive digital process is web accessibility, that is, the ability of information technology systems to provide services and information that can be used by all users, without discrimination (Nielsen, 2000). The accessibility of a website requires that it be designed to ensure it can be consulted by individuals with physical or sensory disabilities. In principle, for many disabled people, information in electronic format is more accessible than in traditional paper form, thanks to the new assistive technologies that allow the translation of content in different perceptual modalities through customized configurations (Silvestri and Ducci, 2004).

First, creating an accessible website means adapting to technical standards for web accessibility. The primary reference is the WCAG. These directives are designed to allow universal website accessibility, regardless of the type of hardware or software used, the network infrastructure, language, culture, geographical location, and degree of disability (Picci, 2002; Polillo, 2006).

The adoption of W3C guidelines is intrinsically linked to compliance with the principles of web eQuality (Blanck, 2014), which become essential prerequisites for promoting participation and social inclusion. From this point of view, an accessible website constitutes a multimedia environment aimed at guaranteeing e-participation, that is, the removal of IT barriers to ensure information content, methods of interaction, navigation procedures, and services are fully usable by any user. The W3C considers accessibility a theme that, while starting from the needs expressed by disabled people, extends beyond this user category to the universal principles of social equity (Baroni and Lazzari, 2013).

Specifically, the W3C guidelines are based on four principles, which constitute the "pillars of web accessibility" (W3C, 2018): the content must be perceivable (it cannot be invisible to all senses of the user), operable

(the components and the navigation of the interface cannot involve an interaction that the user cannot implement), understandable (the operations to be performed must be understandable by the user), and robust (the content must remain accessible from a wide variety of assistive technologies). The guidelines propose standards to web content developers and establish accessibility criteria for each element on a webpage, such as text, background, color, images, and tables (Silvestri and Ducci, 2004). In this regard, Spellman *et al.* (2021) describe the main recommendations in detail, advising web developers that they should:

- provide equivalent alternatives to audio and visual content;
- not rely on color alone;
- create tables that transform gracefully;
- ensure that the user can monitor changes in content over time;
- ensure direct accessibility of the user interfaces;
- provide information for contextualization and orientation on the webpage;
- provide clear navigation mechanisms;
- ensure that the documents are clear and simple.

All objects on the webpage must be visible through assistive technologies for disabled people and provide alternative access. In this regard, the W3C outlines the criteria for equivalent web content, that is, the acceptable substitute that fulfills the same function as the original content at the time of presentation. The ability to use alternative content removes dependence on any cognitive mechanism for understanding. A classic example is alternative text associated with images: describing the content of an image allows access to visual information (Lazzari, 2012). The text equivalent can be presented to the user as a voice synthesis, braille, and text displayed on the screen. Each of these three mechanisms uses one of the five senses—hearing for voice synthesis, touch for braille, and sight for text displayed on the screen—making the information accessible to users with sensory disabilities. The W3C also sets criteria for non-text equivalents, such as icons and pre-recorded speech, which can make documents accessible to people with difficulties accessing written text, including individuals with cognitive disabilities and learning difficulties. A sound description is an example of a non-text equivalent of visual information.

The design of an accessible website allows organizations a substantial increase in potentially reachable users, facilitating the development of long-term relationships with people with skill deficits. Further, compliance with W3C standards is a fundamental requirement to demonstrate firm's commitment to ensuring inclusive communication with its audiences. Thus, compliance with international guidelines testifies to the sustainable conduct of firms and represents a recommendation for evaluating and potentially improving corporate website quality and online services that influence corporate reputation (Joan, 2003). An accessible website is easier to browse for all users and will have many satisfied visitors. Consequently, corporate reputation improves because of the social care for people with disabilities (Kronic, Ruzic-Dimitrijevic, 2007). In fact, companies that engage in CSR activities as part of their public relations strategy are perceived to be socially motivated and develop a stronger positive reputation (Aksak *et al.*, 2016).

Failing to take reasonable measures to provide access to web resources for people with disabilities may undermine the reputation of firms, especially those with traditions of social responsibility (Kelly *et al.*, 2009).

To date, few studies have been conducted verifying the degree of adoption of W3C guidelines on the websites of sustainable firms (Martínez *et al.*, 2014). Therefore, the first research question of this study is:

RQ1: To what extent are W3C guidelines adopted by sustainable firms?

Further, the literature does not empirically investigate the existence of a relationship between compliance with international accessibility standards and the sector and/or geographical belonging of companies. In this regard, for example, some studies show that companies in controversial sectors, that are firms involved with emerging environmental, social, or/and ethical issues, are more active in communicating sustainability on corporate websites (Kilian and Hennings, 2014; Vollero *et al.*, 2019). Instead, in terms of geographical location, it could be assumed that European organizations are more attentive to CSR disclosure (Godfrey and Hatch, 2007; Jackson and Apostolou, 2010). Therefore, the second and third research questions are:

RQ2: Is there a link between the adoption of W3C standards and firm sector?

RQ3: Is there a link between the adoption of W3C standards and the geographical belonging of firms?

3. Research design

The exploratory study aimed at investigating compliance with accessibility requirements by corporate websites of sustainable companies. The sample included the websites of all firms (311) classified in the DJSWI 2018, a global index that identifies the main sustainable companies worldwide. The DJSWI annually reviews about 2500 companies listed in the Dow Jones Global Total Stock Market Index, from which it selects the best performing in terms of sustainability, based on economic, environmental, and social criteria. Specifically, the index includes 10% of all rated companies, which equates to approximately 300 firms. The index is internationally recognized for its transparency and informational objectivity and is widely used in CSR studies (Cheung, 2011; López *et al.*, 2007). Therefore, the DJSWI provides an appropriate empirical context for investigating the accessibility practices of highly sustainable organizations.

The examined organizations are located in different geographical areas (Europe, North and South America, Asia, Africa, and Oceania) and engage in different business activities. The companies have been grouped considering the Global Industry Classification Standard (GICS), a criterion introduced by MSCI in collaboration with Standard & Poor's Corporation (S&P) and accepted worldwide for the sectoral classification of companies to ensure greater comparability in international research.

In detail, business activities are distinguished, according to their core business, into the following sectors:

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- energy;
- materials;
- industrials;
- consumer discretionary (companies more sensitive to economic cycles);
- consumer staples (companies less sensitive to economic cycles);
- health care (pharmaceutical and biotechnology);
- financial;
- information technology (hardware, software, and semiconductor);
- telecommunications services;
- utilities (public goods such as gas, electricity, and water);
- real estate.

As specified, the units of analysis are the corporate websites, as they represent the main communication channel through which organizations inform the public about their commitments and activities. Further, corporate websites should facilitate stakeholder engagement processes, even with users with skill deficits, supporting access to corporate information and favoring public participation in organizational practices (Moreno and Capriotti, 2009; Illia *et al.*, 2017; Siano and Conte, 2018).

To analyze the accessibility requirements of the websites of sustainable organizations, content analysis was conducted (Braun and Clarke, 2006; Smith, 2017), aimed at identifying compliance with W3C guidelines. Each item was treated as a dichotomous variable presenting two alternative values: presence or absence of specific reference to adoption of the W3C accessibility criteria. The preference for dichotomous variables is justified by the fact that they are easier to operationalize than the variables detectable with scaling techniques. The simplification associated with the treatment of dummies, if on the one hand it may seem a weakness in the measurement, on the other hand it has the not negligible advantage of allowing easier detection, reducing the subjectivity and ambiguity inherent in this type of activity.

Further, to limit subjective interpretations, detection of the specific items was carried out by two independent coders, reaching an intercoder reliability of 0.82, which can be considered satisfactory (Krippendorff, 2012). Data collection from corporate websites was performed from July to December 2019.

4. Results

To analyze compliance with W3C guidelines, the study verified the presence or absence of specific indications of the international standards within the corporate websites of firms in the sample examined (RQ1). Table 1 highlights that only 21.5% of websites comply with the accessibility criteria defined by the W3C. The survey finds that most firms (78.5%) have not yet adopted the accessibility standards on their website.

Tab.1: Presence of the W3C requirements on the corporate websites of the analyzed sample

	Frequency	%
W3C compliance	244	78.5
W3C non-compliance	67	21.5
Total	311	100.0

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Source: our elaboration

The study investigated compliance with the W3C criteria among the various business activities of firms through content analysis to verify possible trends in the adoption of accessibility standards by the different sectors (RQ2). The comparison of the percentages of adoption of these criteria highlights different scenarios according to the business activities (table 2).

Tab. 2: Compliance with the W3C requirements by business activities

Business Activity	N.		W3C		Total
			Absence not adoption)	Presence (adoption)	
Consumer Discretionary	43	count %	33 76.7%	10 23.3%	43 100.0%
Financials	55	count %	43 78.2%	12 21.8%	55 100.0%
Industrials	48	count %	44 91.7%	4 8.3%	48 100.0%
Energy	22	count %	17 77.3%	5 22.7%	22 100.0%
Consumer Staples	19	count %	15 78.9%	4 21.1%	19 100.0%
Information Technology	30	count %	21 70.0%	9 30.0%	30 100.0%
Health Care	25	count %	21 84.0%	4 16.0%	25 100.0%
Materials	27	count %	23 85.2%	4 14.8%	27 100.0%
Real Estate	18	count %	15 83.3%	3 16.7%	18 100.0%
Telecommunications Services	9	count %	6 66.7%	3 33.3%	9 100.0%
Utilities	15	count %	6 40.0%	9 60.0%	15 100.0%
Total	311	count %	244 78.5%	67 21.5%	311 100.0%

Source: our elaboration

The websites of utilities companies show greater compliance with the W3C requirements than those of other sectors. In fact, 60.0% of websites have a clear reference to compliance with the accessibility standards; this percentage is far higher than the average percentage of W3C standards adoption across all sectors (21.5%). Firms in telecommunications services

(33.3%) and IT (30.0%) reach a good level of accessibility. On the contrary, the study shows poor adoption of the W3C standards by websites of industrial companies (8.3%). Materials (14.8%), health care (16.0%), and real estate (16.7%) sectors also reach moderate adoption percentages, below the sectoral average percentage.

Pearson's chi-square test, reported in table 3, highlighted that the relationship between the two variables (business activity and W3C adoption) is significant (p-value < 0.05).

Tab.3: Pearson chi-square test

Pearson chi-square test	
Chi- Square	21.619
df	10
P- value	.017

Source: our elaboration

Finally, the survey investigated the relationship between the degree of adoption of W3C requirements and the geographical origin of the companies belonging to the sample (RQ3) (table 4). The differences between continents, when compared with the average percentage (21.5%), shows that European firms are more attentive to international standards in terms of website accessibility (30.8%). In contrast, company websites in South America are less compliant with the standards (7.7%).

Tab.4: Compliance with the W3C requirements by geographical areas

Continents	N.		W3C		Total
			Absence not adoption)	Presence (adoption)	
Africa	5	count %	4 80.0%	1 20.0%	5 100.0%
Asia	58	count %	52 89.7%	6 10.3%	58 100.0%
Europe	156	count %	108 69.2%	48 30.8%	156 100.0%
North America	60	count %	53 88.3%	7 11.7%	60 100.0%
Oceania	13	count %	15 78.9%	4 21.1%	19 100.0%
South America	19	count %	12 92.3%	1 7.7%	13 100.0%
TOTAL	311	count %	244 78.5%	67 21.5%	311 100.0%

Source: our elaboration

Tab. 5: Pearson chi-square test

Pearson chi-square test	
Chi- Square	17.107
df	5
P- value	.004

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Pearson's chi-square test (table 5) confirms that the relationship between the two variables (geographical origin and W3C adoption) is significant (p-value < 0.05).

5. Discussion

The purpose of the exploratory study was to highlight current trends relating to the adoption of accessibility requirements on websites of sustainable firms classified by the DJSWI. Findings show that most corporate websites do not comply with W3C standards and consequently do not respect accessibility guidelines. The limited fulfillment of W3C requirements in website design underlines that firms devote little attention to adopting universal principles of social inclusion, which is closely related to corporate sustainability (Gould *et al.*, 2020). Thus, the study highlights that firms' commitment to sustainability actions does not guarantee an adequate level of adoption of the W3C guidelines. This result is in line with the study by Martínez *et al.* (2014), which showed a contrary influence effect between commitment to CSR and adoption of accessibility standards: the companies engaged in CSR had less accessible websites. This could be justified considering that accessibility requirements are still little known in the business environment and are not on the agenda of stakeholder requests (De Andrés *et al.*, 2010). Therefore, firms are still not very sensitive about guaranteeing users with disabilities the right to access information and adequate involvement in business practices. Considering this, the corporate website is configured as a tool that amplifies the digital divide, as it does not allow web equality between users in the process of accessing, displaying, processing, and interpreting corporate information (Van Dijk, 2020).

Findings also show an association between the adoption of accessibility standards and firm sector. In particular, the study highlights that the utilities sector is more committed to respecting international guidelines. This means that this sector, regardless of the current regulations, is the first to have begun implementing practices on websites aimed at achieving an inclusive digital process. This trend could derive from the peculiarities of this sector, which provides public utility goods and services (such as gas, electricity, water), which generally occurs under the direct or indirect control of the state. Therefore, the core business of these companies is oriented to meet community needs and avoid social discrimination. In fact, utilities are pushed, from a strategic point of view, to create solid

relationships with all citizens and to develop the sustainability policies that are a distinctive feature of this sector (Arena *et al.*, 2019).

This trend may also be partly since the utilities is one of the sectors labeled as “controversial” by the CSR literature (Kilian and Hennings, 2014): given the potential negative impact of industrial processes, companies operating in these sectors could be induced to engage more in sustainability initiatives to gain public legitimacy. Strengthening web accessibility, guaranteeing access to disadvantaged social groups, could be part of practices aimed at ensuring social sustainability.

In the comparison between business activities, it is also interesting to note greater attention to W3C criteria compliance by companies in the telecommunications services and IT sectors. Obviously, these sectors have more skills in the field of digital technology and are, consequently, more likely to integrate online accessibility criteria into their websites. Otherwise, the industrial sector, which comprises companies operating in capital goods, appears to be less attentive to W3C standards compliance. This is explained by the business-to-business nature of this business activity, aimed at developing relationships to sell production processes components into the supply chain. Thus, such companies may have little interest in creating digital dynamics based on dialogue with final consumers (Jarvinen *et al.*, 2012) and in designing an inclusive website for users with disabilities. However, it is likely that recent trends toward the creation of increasingly sustainable supply chains (Seuring and Müller, 2008) may favor better alignment with disabled users’ needs.

It is also interesting to note a negative trend for health care firms, which should be, because of the social relevance of the products marketed, more sensitive and attentive to issues relating to the inclusion of disabled people and to CSR and stakeholder engagement processes (Saviano *et al.*, 2018).

In addition, the research identifies an association between W3C compliance and the geographic belonging of firms analyzed in the empirical research. Findings show that European companies are more active in adopting accessibility guidelines than those of other continents. European organizations have historically been the first to adhere to corporate sustainability standards; consequently, the greater number of such companies in the DJSWI index demonstrates a more significant adherence to the principles of CSR established at international level. Indeed, it is assumed that CSR is largely a Western cultural phenomenon, as most of the CSR reporting norms and standards have been developed and institutionalized in Europe (Godfrey and Hatch, 2007; Kadyan, 2017). It is therefore conceivable that the factors justifying this trend are the presence of a corporate culture more sensitive to CSR values, the active regulatory environment on these issues, and the incentive to emulate corporate best practices. These peculiarities appear to be less present in South America, which is characterized by a lower sensitivity toward problems of social inclusion and limited opportunities for firm-level debate and discussion on sustainability issues (Dobers and Halme, 2009).

6. Implications, limitations, and future research

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This research broadens the studies on inclusion practices in digital contexts (Ball *et al.*, 2005). In particular, it contributes to the debate on online accessibility for disabled users, identifying measurement elements in the context of websites (W3C requirements) and providing empirical evidence on international guidelines adoption by sustainable firms. Further, compared with previous studies, the paper investigates a large sample of companies, classified in the DJSWI, adopting the content analysis technique, which has been used widely to examine social responsibility disclosure on corporate websites (Smith, 2017).

The study also presents interesting insights from a managerial point of view. Results allow marketing and business management professionals, as well as digital communication managers and consultants, to evaluate and improve corporate performance relating to accessibility practices on websites. In fact, the critical issues that have emerged must be a stimulus for companies to engage more actively in establishing processes of democracy and participation in digital environments. The access to web services and information tools on corporate websites is today an indispensable requirement for implementing social inclusion actions, which are essential to the development of a strategic orientation aimed at respecting sustainability and stakeholder engagement principles. In this regard, the involvement of disabled people in content and actions on the corporate website allows the firm to expand its stakeholder groups. In fact, an inclusive view implies a significant increase in the number of stakeholders, since an accessible design makes the website available to a wider audience (Krunic and Ruzic-Dimitrijevic, 2007).

The adoption of a “stakeholder inclusive” approach, in particular a “disable person inclusive” perspective, supports companies in sustainability communication, increasing social legitimacy (Fernando and Lawrence, 2014; Luo *et al.*, 2015). Accessibility certification positively influences users’ perception of corporate CSR, so companies would be wise to invest in the adoption of international requirements (Katerattanakul *et al.*, 2018). To this end, it is essential that firms make a financial commitment to employing web designers or an IT staff educated in accessibility, as well as consulting firms focused on this issue (Loiacono and Djasasbi, 2013). This reduces the risk for firms of suffering damage to their image due to discrimination and digital divide actions (Van Dijk, 2020). Guidelines also help firms ensure their websites are less subject to complaints concerning accessibility (Babi and Kopp, 2020). Further, from a managerial point of view, ensuring a “design for all” perspective (Klironomos *et al.*, 2006; Persson *et al.*, 2015) is advantageous to companies not only in terms of image and reputation (Fombrun and van Riel, 2004) but also economics, as an increase in potential customers can improve market share and profit, enhancing corporate competitiveness (Flak and Pyszka, 2011).

In our opinion, the real crux of this issue remains the belief by the ownership and the management of for-profit organizations to make a decisive “qualitative leap” in the direction of greater social inclusion. It is necessary to understand whether firms deal with accessibility only

to emulate competitors or to follow current trends that often translate into greenwashing practices, or differently for the convinced strategic orientation of the top management and the firms' members at all levels, aware that reputational capital, and corporate success, increasingly depends on consistent cultural and value changes. In this regard, it would be useful to develop future studies aimed at bringing out the aforementioned changes, making use of control indicators to detect scientifically the presence of evidences showing that the qualitative leap is occurring.

This study has some limitations that could be addressed in future research. First, the content analysis method implies the typical limits associated with the subjective evaluation of researchers (Beattie *et al.*, 2004). Further, the sample of companies examined in the pilot study requires future development to broaden the investigation, paying attention to the fair distribution of firms in business activities and geographical areas. Future studies could also extend the empirical investigation to companies outside the DJSWI, thus to organizations that are not leaders in sustainability, as it would be interesting to compare the percentages of adoption between organizations classified as sustainable companies and organizations not on any sustainability index.

In addition, the research could be enriched by including other potential factors that influence adherence to web accessibility requirements, such as firm dimension (large/small firms), time on the market (established/start-up firms), or more firm-specific characteristics. The effect of new regulations in Europe on web accessibility and, in general, on the consolidation in Europe of a corporate culture based on social inclusion could also represent an interesting line of research.

Finally, this research does not claim to be exhaustive, as it focuses on limited factors, namely, the presence or absence of adoption of the W3C requirements by websites. Therefore, future research might investigate a broader set of elements related to social inclusion dynamics to extend the analysis to other digital tools, including corporate social media.

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The intersection of spirituality and succession in family firms: a systematic literature review and research agenda¹

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Abstract

Frame of Research. This paper presents a systematic review of existing research on the role of spirituality and values in the succession process of family businesses.

Objectives. The aim of this paper is to identify the potential interplay between spirituality and succession in family firms and uncover the main streams of research from which to build the future agenda.

Methodology. The researchers perform a systematic literature review (SLR), retrieving 115 scholarly articles published in the last 30 years from Clarivate Analytics' Web of Science and Google Scholar databases.

Findings. The results reveal five main themes synthesizing the content of the sampled articles, indicating that the values derived from authentic spiritual adherence serve as a means of strategizing regarding succession. Finally, this study identifies a rich research agenda.

Practical implications. Mapping the literature across family firms' spirituality and succession offers a novel perspective for family business owners and practitioners, shedding light on why family firms recognize spirituality at work or not, what firms mean by this spirituality, and how family firms make use of spirituality without instrumentalizing it.

Limitations of the research. The main drawback of this project is that the examined literature is not exhaustive because it is based on only two databases and focused exclusively on articles. Future research can consult other databases and combine them to obtain a more inclusive dataset.

Originality. This paper provides the first systematic literature review regarding spirituality in family business studies while investigating how it intersects with the problematic issue of succession.

Key words: family firms; spirituality; values; succession; Systematic Literature Review

1. Introduction

The twenty-first century is complex, dynamic, fast-paced, non-linear, multicultural, and knowledge-intensive (Waddock, 2006). It has been

¹ The paper is the result of the joint work of the three authors. However, the descriptive results, findings, discussions, and conclusion are attributable to Aiza de Torres Asi; the methods, implications, and limitations to Michela Floris; and the introduction and the discussions of the new "what, why, and how" of spirituality to Giuseppe Argiolas. The research agenda was set collectively.

suggested that spiritually based organizations should not be considered a passing fad but, rather, a necessity for the third millennium (Vasconcelos, 2015). Wisker *et al.* (2019) underline the contribution of the early spirituality scholar Frankl (2000), who suggested that society's major problem in the twenty-first century is that it lacks knowledge of meaning in life, a situation he termed an "existential vacuum." The motives and deeply held values involved in the integration of spirituality into the business workplace are of increasing interest to both scholars and practitioners (Cavanagh, 1999; Driscoll *et al.*, 2019). Insights into how spiritual values and meaning are manifested (Driscoll *et al.*, 2019), how values are formed and preserved (Astrachan *et al.*, 2020), and how spirituality can be integrated into business processes and behaviors are reflected in seminal works of this nascent domain. In other words, spiritual values are innate in people (Lepherd, 2015) and have always existed in the workplace (Reave, 2005).

The extant literature has mainly focused on the spirituality found in workplace dynamics from an employee-organization perspective in the search for meaning and purpose (individual level), sense and community (group level), and alignment with the organization's values (organizational level) (Hill, Jurkiewicz, Giacalone, and Fry, 2013).

This paper deepens the study of a specific kind of business: family-owned firms, which are those firms *that are* fully owned and managed by members of a founding family, have owners with a clear intention to pass the business to their offspring, and have owners who perceive their business as being pervaded by family beliefs and values (Aronoff and Ward, 2001). Understanding how family businesses operate is important because they represent the most popular kind of firm throughout the world; function in different territories; and must face social, political, economic, and cultural changes and challenges (Tobak and Nábrádi 2020). Specifically, this study focuses on the espoused spirituality of family business owners and its potential influence on the succession process in terms of both ownership and management. Succession, which is regarded as one of the most critical issues in family-business management (Shen and Su, 2017), has received little attention, particularly in terms of how spiritual values are transmitted among family firm leaders, as well as how this relates to business continuity. In this perspective, Fry and colleagues (2017) introduced "spiritual leadership." Although this kind of leadership is in harmony with the definition of spirituality in family firms, where we anchor our study, we choose not to limit the horizon but, instead, embrace all other kinds of value-based leadership.

The literature on family business values and succession appears fragmented, and empirical and theoretical studies recognize the need for a deeper understanding of how values are transmitted across generations (Zwack *et al.*, 2016; Koiranen, 2002; Eze *et al.*, 2020), beginning with personal values, which could be a relevant factor in the success or failure of family firms (Camfield and Franco, 2019a). Intending to contribute to this ongoing debate, this study proposes a systematic literature review (SLR) of the last 30 years of academic publications in leading journals so as to understand the *what*, *how*, and *why* (Krishnakumar and Neck, 2002)

regarding family owners' spiritual values and sustained family business succession.

Here, we refer to spiritual values as a “*unique experience for every individual*”. This is the pioneering description offered by Freshman (1999) within grounded theory, which, according to Marschke *et al.* (2009), is best suited to defining this phenomenon because of its complexity and highly personal nature. Using this simple definition, contemporary scholars identify attributes to describe this transcendental experience. Scholars' contributions to the definition, such as those of Giacalone and Jurkiewicz (2003), Dunchon and Plowman (2005), Gotsis and Kortezi (2008), will thus contain the concepts of meaningfulness, completeness and joy, connectedness, and the experience of transcendence (Schutte, 2016). This is in line with Hoffman's (2007) finding that the notion of making work meaningful and integrating work with the remainder of life is consistently seen in the research on the workplace and approaches to spirituality (Schutte, 2016). This definition is suitable in the analysis of family firms because family involvement in businesses results in certain distinctive value-based behaviors (Chrisman *et al.*, 2005).

The findings show five main themes of the research and two sub-themes, describing the emerging intersection of spirituality and succession. The major interplay shows that values that are derived from authentic spiritual adherence serve as both a means of strategizing succession and a subject of transmission. Finally, this study identifies a rich research agenda.

Through the analysis and interpretation of the family firm spirituality literature, this study contributes to the family business literature, offering an extensive review of the state of the field. Suggestions for future directions in view of the research agenda on understanding spirituality and value-based succession offer a foundation from which future research can build. To gain a more thorough and broader range of cultural and geographic circumstances, we suggest conducting longitudinal quantitative research and a cross-cultural case study.

2. Methods

To ensure a thorough review of the extant family business literature on spirituality and transgenerational passage, we adopt a comprehensive, objective, and reproducible search strategy to capture all relevant sources of evidence through a systematic literature review. Because family firm studies are still maturing, many publications are reviewing, summarizing, and rethinking developing trends and future development in this field from different perspectives (Debicki *et al.*, 2009; Chrisman *et al.*, 2010; Wright and Kellermanns 2011; Gedajlovic *et al.*, 2012; Sharma *et al.*, 2012).

Despite the fact that the *Web of Science* (WoS) and Scopus databases, two of the most well-known journals indexing, have been extensively compared for more than 15 years using various criteria and multilevel analysis, the scientific community has yet to reach an agreement on which is better. For the purpose of this study, we selected the WoS as the main database because it is a premier worldwide database of papers containing more than 12,000

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authoritative and high-impact academic journals from the Social Science Citation Index and Social Science Citation Index-Expanded. We agree with Bramer *et al.* (2017) that this database is adequate for conducting literature reviews. Another factor is the timeframe from which the WoS covers the cited references, since 1900, as opposed to Scopus, which covers references since 1970 (Pranckutė, 2021). We complemented the WoS search with Google Scholar due to their reciprocal linkage, which provides the researcher with an intuitive way to access and evaluate information and easy access to full text. In an attempt to determine the availability of some hand-searched articles, we explored databases such as Proquest, Business Source Complete (EBSCO), and EconLit (EBSCO) and contacted authors to complete the copy of the searched articles. We focused on peer-reviewed international journals published in English. Tennant (2018) considers peer review to be one of the strongest social constructs within the self-regulated world of academia and scholarly communication, thereby excluding books, book chapters, and other non-refereed publications due to more significant variability in the peer-review process and limitations on their availability (Jones *et al.*, 2011).

We used a systematic approach, following the four stages of the selection process used by Calabrò *et al.* (2019). However, some modifications have been made to suit the nature and context of the present research.

2.1 Search and elimination of duplicate

To ensure the relevance of the extracted papers, we scanned for potential articles that fit the study using a combination of the following keywords in the title or abstract: starting with the fundamental criterion of “articles only” and upon applying the restrictions identified above, the first step in the search process included identifying family firm articles (Family Firm* or Family Entrepreneurship* or Family Enterprise* or Family-Owned Firm* or Family-Owned Business* or Family Run Firm* or Family Run Business* or Family Run Enterprise* or Family Business*) from the mainstream literature. The first broad article search resulted in 16,036 hits. In the next step, using the search string (value* or reciprocity or religion* or communion or spirituality or unity or solidarity or altruism or philanthropy or trust or quality or resilience), we combined the result with that of the first hit, obtaining 4,741 hits. Then, we combined these research results with the succession search (succession or “generational passage” or “transgenerational passage” or “legacy” or “baton”), yielding a reasonable number of 264. While using the Google Scholar search string Spirituality / Religion / Values in Family Firm Succession, we found another 69 articles, for a total of 333. We then eliminated 84 articles that were either duplicates or substantively irrelevant. In this way, we obtained 249 potential articles, and all were included for the preliminary evaluation to ensure a wide-reaching search. Because our objective is to find the intersection of spirituality and succession, most of the chosen articles do not contain them both, so we had to assess carefully and handpick those articles on succession that have reference to considering spiritual values or values directly or indirectly.

2.2 Title and abstract analysis

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Following Tranfield and colleagues' (2003) prescriptions, independent assessments of the abstracts were performed to identify their substantial empirical, conceptual, and theoretical contributions to the family business spirituality and succession literature. For empirical papers, the abstract needed to indicate spirituality as an independent, dependent, mediating, or moderating variable. For conceptual papers, spirituality and values needed to be the dominant topic of the paper. In contrast, regarding theoretical studies, we refer to workplace spirituality development, which essentially refers to translating spirituality from a concept to a science. A total of 217 studies were admitted to the next step.

1. Full-text assessment

Then, we examined the selected sample more closely and (cross-) read the entire articles to guarantee a sufficient level of rigor and relevance. Due to non-compliance with the established selection criteria, another 133 articles were excluded.

2. Hand Searching

We found 31 hand-searched articles through citation tracking; thus, the final dataset comprised 115 articles published in 63 journals (see online supplement material: Table 6). The procedures mentioned above are shown in Table 1.

Tab. 1: Systematic literature review procedure

Filter	Description	Web of Science ISI	Google Scholar	Total
Step 1	Articles with selected keywords	264	69	333
	After merging the results from the different databases and deleting duplicate articles			249
Step 2	After reading the titles and abstracts and eliminating the non-relevant articles			217
Step 3	After reading the full articles and eliminating the non-relevant articles (we extracted articles that explicitly deal with Spirituality and Transgenerational Passage jointly)			84
Step 4	Hand searching and citation tracking		31	31
Final sample				115

Source: Authors' elaboration

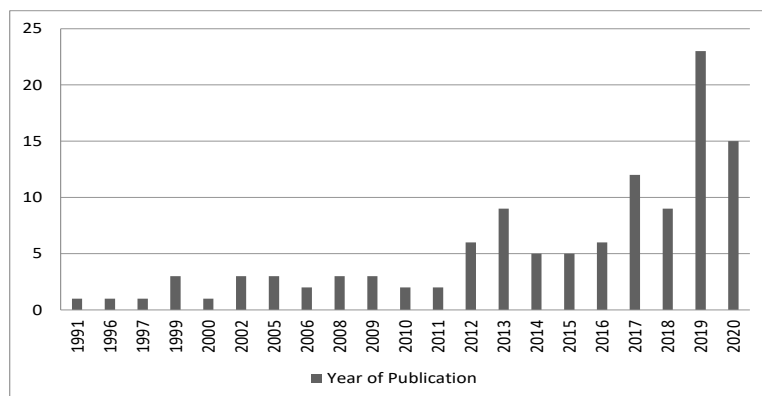
Search criteria for Web of Science: Time Span: 1990–2020 (Maximum range available for this database). Citation Databases: Science Citation Index Expanded (SCI-Expanded) 1991–present; Social Sciences Citation Index (SSCI) 1991–present; Arts & Humanities Citation Index (A&HCI) 1991–present. Lemmatization Mode On. Document Type (Article); Language (English); Countries/ Territories (All); Web of Science Categories (Management; Business; Family Studies; Economics; Sociology; Social Sciences Interdisciplinary; Psychology Developmental; Anthropology;

3. Descriptive results

Publication Distribution

Following the descriptive reviews adapted by Samara (2020) and Pret and Cogan (2019), the studies of family enterprises' spirituality and values continue to grow in number. Scholars have studied family firm spirituality for about 30 years. The first contribution, which can be traced back to 1991 (one article), increased over the next ten years (twelve articles), continued to rise from 2006 to 2016 (42 articles), and has substantially increased from 2017 to 2020 (57 articles). The distribution of these publications per year is clearly presented in Graph 1. These articles are widely dispersed throughout scholarly publications, and it is the *Journal of Business Ethics* (10) that has the most contributions to the topic, followed by the *Journal of Management, Spirituality & Religion* (9) and both the *Journal of Family Business Management* and *Family Business Review* have the same quantity (8) (see online supplement for the list and distribution of journals: Table 6). Although numerous articles in the field have been published in highly ranked journals (using Scimago Ranking), we broaden the scope to consider all other articles while remaining faithful to the criteria mentioned above.

Graf. 1: Spirituality / Values in Family Firm Succession Publication Distribution



Source: Authors' elaboration

Research contexts and perspectives

This review shows that studies on family firms' spirituality have been conducted in various countries. It is worth noting that all continents are represented, based on their geographical research context, where the

majority of studies are set in Europe (41) and North America (35), with some studies being conducted in Asia (22). Africa (5), Latin America (5), Oceania (3), and the Middle East (4) represent under-studied regions, where further investigation is encouraged to offer a global perspective in the field (Astrachan *et al.*, 2020). Most of these papers have been published in the UK (40), followed by the US (35) and the Netherlands (11), and the remainder of the countries have fewer than few, with a majority of these countries producing only a single article (see Table 2). Is this to imply that there are no such issues of succession in countries other than Europe and North America? In Chau’s (1991) “*Approaches to Succession in East Asian Business Organizations*”, she demonstrates aspects of business organizations that make East Asian family firms distinct. Through a comparative analysis, she shows how Americans see East Asian culture as monolithic and admire how they have become business tycoons in the twenty-first century. For example, Japan attributes this success to its traditional family-values-based management system and primogeniture as a succession style. She further argues that some Japanese business enterprises have remained in existence for one or two hundred years using this method. Hence, research that crosses national boundaries should investigate how the physical and material aspects of culture are connected through processes (Pret and Cogan, 2019).

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Tab. 2: Country of Publication

UK	40
USA	35
Netherlands	11
Germany	8
Canada	4
Australia	3
Switzerland	3
China	1
Finland	1
France	1
Greece	1
Hungary	1
India	1
Italy	1
Korea	1
Mexico	1
New Zealand	1
South Africa	1
Total	115

Source: Authors’ elaboration

Research Methods and Approaches

Through this SLR, we find that the extant literature over the last 30 years (see Table 3) mostly applies agency theory as a scientific lens (10) (e.g., Harris and Ozdemir, 2020; Madison *et al.*, 2016), followed by the

theory of planned behavior (6) (e.g., Mussolino and Calabrò, 2014), entrepreneurship and spiritual leadership theory (4,4) (e.g., Eze *et al.*, 2020; Tabor *et al.*, 2019; Low and Ayoko, 2020; Madison and Kellermanns, 2013), and the use of a combination of two or three theoretical approaches to prove the validity of their findings (Pret *et al.*, 2016). It is also important to note that 11% of the reviewed publications embraced the social dimension as a theoretical lens, such as social capital, social exchange, social identity, socio-emotional selectivity, and socio-emotional theories, making it one of the dominant paradigms of the family business literature in the last decade (Gómez-Mejía *et al.*, 2018).

Tab. 3: Theoretical Perspectives

Agency Theory	10
Theory of Planned Behavior	6
Entrepreneurship Theory	4
Spiritual Leadership Theory	4
Prospect Theory	3
Stewardship Theory	3
Authentic Leadership Theory	2
Expectancy Theory	2
Grounded Theory	2
Personal Values Theory of Schwartz	2
Social Capital Theory	2
Socio-Emotional Theory	2
Boundary Theory	1
Cultural Dimensions Theory	1
Leader-Member Exchange Theory	1
Neo-Institutional Theory	1
Organizational Knowledge Creation Theory	1
Reciprocity Theory	1
Relational Leadership Theory	1
Resilience Theory	1
Resource-Based Approaches	1
Social Exchange Theory	1
Social Identity Theory	1
Socio-emotional Selectivity Theory	1
Stakeholder Theory	1
Strategy-as-Practice Theory	1
System Theory	1
Succession Theory	1
Theory of Family Business Succession	1
Theory of Matriarchy	1
Unification Theory of Succession	1

Source: Authors' elaboration

The proliferation of this social perspective, specifically the socio-emotional wealth derived from the spiritual workplace, is explained

further in the theme of spiritual development. Approximately one-half of the papers did not use any analytical lens, representing the exploratory stage (Samara, 2020) of research on family firm spirituality and succession. As shown in Table 4, the studies performed in the field are relatively well distributed among the identified approaches in terms of research methods. Most articles used a qualitative approach (41%), and one-fourth used a quantitative approach (25%), while only two articles used mixed methods (2%), and a significant number of articles were conceptual in nature (32%). Pindado and Requejo (2015) support the notion that this finding is consistent with the work of those management scholars who have been developing a comprehensive theory of the family firm. This type of study offers a more detailed investigation of how family firms' processes unfold and how they are affected by various intra-family dynamics over time (Bammens *et al.*, 2011). However, this preliminary finding suggests that more quantitative research should be employed. For instance, case studies, specifically longitudinal ones, are particularly relevant to organization and management studies because they shed further light on the various dynamics within an individual set-up.

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Tab. 4: Summary of Research Methods

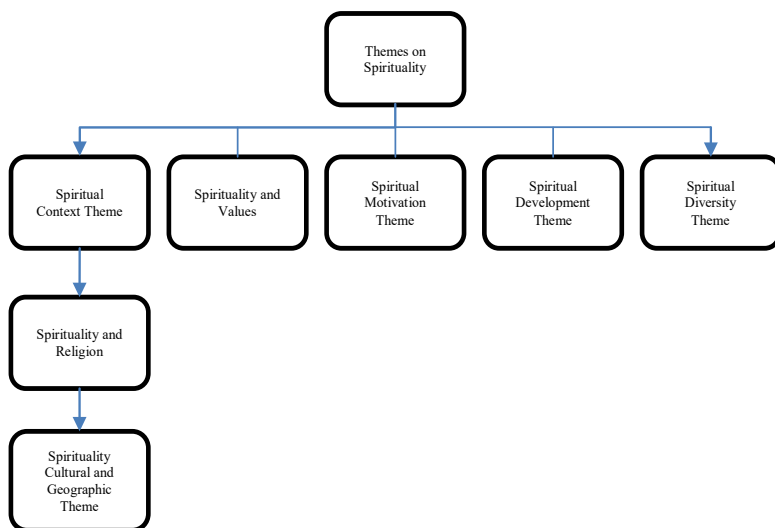
Years and Level of Analysis	Empirical n (%)			Systematic Literature Review n (%)	Conceptual n (%)	Total n (%)
	Quantitative	Qualitative	Mixed			
Publication Years						
1991–2006	1	6	1	0	5	13 (11.30%)
2007–2016	7	13	1	0	10	31 (26.96%)
2017–2020	21	28	0	0	22	71 (61.74%)
Total n (%)	29 (25.22%)	47 (40.87%)	2 (1.74%)	0 (0%)	37 (32.17%)	115

Source: Authors' elaboration

4. Findings

The in-depth analysis of the sampled articles is summarized in Figure 1, which is presented to facilitate the flow of the discussion regarding the themes.

Fig. 1: Graphical Presentation of Spirituality Themes



Source: Authors' elaboration

First thematic group: Spiritual Context Theme

The family firm context is strongly embedded throughout the literature examining how spirituality is translated into business activities. The context examined in the studies provides a frame of reference that constitutes and governs the interrelationship between the parts and the whole. Academics recognize that people's religious affiliations, location, culture and traditions, and family norms can all have a significant impact on spiritual values, and vice versa (Eze *et al.*, 2020; Cruz *et al.*, 2013; Paterson *et al.*, 2013; Samara, 2020; Kavas *et al.*, 2020; Kamoche and Pinnington, 2012; Bhatnagar, 2019; Low and Ayoko, 2020; Driscoll *et al.*, 2019; Camfield and Franco, 2019a).

Given these premises concerning spiritual values, the context of belonging influences each individual's value system. In a macro-social context, the personal value system receives the impact of social values through exposure to and observation of the larger society's culture (Hynie *et al.*, 2006). However, an individual's value system is constructed in the family context or microsystem (Bronfenbrenner, 1986) and created and maintained through social relationships in the family sphere, which are usually transmitted across generations over time, generating a behavioral system based on the beliefs, models, and values of all family members (Bengtson *et al.*, 2002). Articles in this group have delved more deeply into two major topics: spirituality and religion, as well as the cultural and/or geographical aspects of spirituality.

Spirituality and Religion

The terms "spirituality" and "religion" are frequently used interchangeably. While there are similarities between the two constructs, there are also significant differences (Karakas, 2008). Out of 22 reviewed articles on spirituality from a religious perspective, 24 percent use the

two constructs interchangeably; 14 percent argue that they are completely different; 19 percent emphasize their coexistence; another 19 percent show differences but conclude with the relationship; and the remaining 24 percent emphasize their similarities and, thus, the connection that binds them, despite demonstrating significant differences. The purpose of this study, however, is not to broaden the rigorous investigation performed in religious semantics as compared to spirituality, or *vice versa*.

All across the investigations, it is clear that organizations are wary of initiating discussions and meaningful dialogues about spirituality because spirituality has frequently been viewed as synonymous with religiosity (Schutte, 2016). According to Giacalone and Jurkiewicz (2003) and Mitroff and Denton (1999), workplace spirituality should be viewed as distinct from religion. Mitroff and Denton (1999), who conducted an empirical study on spirituality in the workplace, found that respondents could have a negative view of religion but a positive view of spirituality. It is possible to be spiritual without believing in or affirming the existence of a higher power. Furthermore, Marschke *et al.* (2009) acknowledge that while every human being is spiritual, not every human being is religious. Despite the literature's polarization, Neal and Vallejo (2008) agree with Wedemeyer and Jue (2002) in recognizing the benefits of participation in an organized religious community, while Kellermanns (2013), Paterson *et al.* (2013), and Dieleman and Koning (2019) recognize religion as a critical source of workplace spirituality and values. "At the same time, any efforts to create a more spiritual business must recognize that employees may be uncomfortable or even fearful of explicit expressions of religious faith in the workplace. Furthermore, respecting the diversity of belief systems, including those who do not identify with any spiritual or faith tradition, is pivotal" (Neal and Vallejo, 2008: p.118).

Scholars distinguish between the two terms, but many people believe they overlap (Reave, 2005), as evidenced by major religions such as Christianity and Buddhism, Hinduism, Islam, and Judaism (Case and Gosling, 2010; Deckop *et al.*, 2003). Authors who support this viewpoint associate spirituality with religious practice, which they define as "the formal, organized, collective observance of one or more of the world's major religions." Researchers are frequently confronted with the difficult question of whether spirituality in the workplace should be linked to or separate from religion in order for scientific research to progress. According to Hill, Jurkiewicz, Giacalone, and Fry (2013), it is necessary to consider whether workplace spirituality is conceptualized at the individual or organizational level. They argue that conceptualizing and measuring spirituality at the individual level could be done independently of religion or through codified beliefs. They go on to say that "spirituality is necessary for religion, but religion is not necessary for spirituality." As a result, workplace spirituality can be inclusive or exclusive of religious theory and practice." However, at the organizational level, workplace spirituality should be separate from religion, unless religion is explicitly linked to the organization's mission (Hill *et al.*, 2013: pp. 5).

Kavas *et al.* (2020) investigate how Islamic religious values affect business activities through a qualitative study of two Anatolian-based

family firms in Turkey. They discover that religion, through the adherence to religious values of the owning family, is a source of at least some of the repertoire of practices that people draw on in business contexts. Their research shows not only how the family incorporates religious practices into everyday business activities but also how religious values define and limit the nature of the rationality that guides business activities (Kavas *et al.*, 2020). This demonstrates a strong link between religion and business, with the former establishing a comprehensive framework of meanings through which business decisions are made (Astrachan *et al.*, 2020). Along these lines, Hicks (2002) believes that spirituality, as an integral part of human experience, cannot be excluded from many aspects of human life and action. These viewpoints support Harris and Freeman's (2008) common belief that the separation thesis must be abandoned while integrating economic and moral conditions. Special emphasis is given to Douglas Hicks's (2002) proposal for "Respectful Pluralism" to emphasize the complexities of religion, ideology, and orientation in the workplace. Respectful pluralism means opposing corporate-sponsored religion and spirituality but allowing employees to bring their own religion to work, as long as they adhere to specific moral guidelines. He believes spirituality is an essential component of human culture. When a person goes to work, he or she brings his or her entire being with him or her.

Using rhetoric analysis, Dieleman and Koning (2020) discover that, despite not being part of the founder's legacy, the Christian identity emerges as the most influential of three sources of identity (religious, cultural, and corporate). This leads to a broad discussion about the development of values based on religion, culture, and sustainability. The manner in which these values are expressed is highly contextual, relational, and aspirational, rather than historical (as previously assumed) (Astrachan *et al.*, 2020). Data gathered by Fathallah *et al.* (2020) allow them to show how different religious values and principles influence decision-making. Muslim family businesses tend to make decisions based on rules, whereas Christian family businesses make decisions based on principles. Bhatnagar *et al.* (2019) investigate how Hindu spirituality influences businesses based on its two fundamental spiritual beliefs of dharma (duty to society) and karma (right to act without expectation of reward) instill a duty-bound giving culture in Hindus. In controlling families, however, the strength of each belief varies.

Fernando and Jackson (2006) present their findings from in-depth interviews with thirteen prominent Sri Lankan business leaders from Buddhist, Christian, Hindu, and Muslim religious traditions. When asked why they chose to work in a faith-based environment, the leaders' responses were frequently linked to decision-making. They stated that during "challenging" times, the numerous management tools at their disposal must be supplemented with transcendent reality, God, or truth, which is powerful, better, and good. This finding is consistent with Shen and Su (2017), who find that Eastern religious beliefs, particularly Buddhism, strengthen the religiosity-succession relationship in Chinese family firms.

Spirituality's Cultural and Geographical Context

The literature provides the key to understanding culture by referring to two perspectives and their interplay: national culture and organizational culture (Ansah *et al.*, 2019). The former refers to the culture of a specific group of people, whereas the latter refers to the spiritual cultural element seen in an organization. This section examines the connection between these cultures, as well as the potential implications for the current value-based business environment.

Discua (2014), referring to the Christian family business, underlines the impact of the society in which it is embedded and from which particular sets of values, attitudes, laws, and business practices are absorbed. In the study of the dynamics of spirituality in the Indian ethos in the workplace, Gupta *et al.* (2011), on the other hand, report that firms more often use spirituality as a tool to resolve motivation and productivity problems rather than as an encounter to bring about cultural change in company decision-making and orientations. Their analysis demonstrates how, in the Indian tradition, spiritual dimension and business have always coexisted and are responsible for all human development and evolution. Both the spiritual and physical aspects converge in the Indian culture's "Darma" (righteousness) principle. The mechanics of initiating, managing, and sustaining cultural change using spiritual values (their specific ethos as Indians) as a scaffold for this organization's cultural change are at the heart of the relationship between spiritual values and culture.

According to Fernando and Jackson (2006), the Sri Lankan collectivist culture is known to reflect a substantial need for affiliation; as a result, this cultural characteristics among Sri Lankan people may result in a higher level of regard for others' welfare, emphasizing the need to accommodate others in the decision-making process. The spiritual practices of the leaders are attributed to this collectivist culture, with its need for connection with others and the ultimate, as well as people's sense of rightness in decision-making (Fernando and Jackson, 2006).

Beekun and Westerman (2012) compare the United States and Norway in their research on spirituality and national culture as antecedents to ethical business decision-making. According to the findings of this study, the more spiritual Norwegians were, the more ethical their decision-making was. In contrast, the more spiritual Americans were, the less ethical their decisions were. Their explanation for these contradictory findings could be attributed to the fact that spirituality can mean different things to different people (Cavanagh, 1999; Driscoll *et al.*, 2019). Based on the authors' view of spirituality that underlines connectivity and meeting others' needs, they postulate that spiritual Americans do not share the same view.

Second thematic group: Spirituality and Values

Values define what is essential to organizations, and they are frequently associated with spirituality (Sorenson, 2013). There is no unambiguous reference in the business spirituality literature that distinguishes spirituality from value concepts and *vice versa*. Rather, it is interesting to note that, when authors refer to values in a workplace spiritual context, they use these terms homogeneously; as Kellermanns (2013) observed, family

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business values may be influenced by the level of spirituality and religious beliefs of the owning family. They use these two terms interchangeably, such as “spiritual values” or “values,” which we also used throughout the study. Scholars of family business literature use either “spiritual values” or “values” to refer to religious values (Barbera *et al.*, 2019; Astrachan *et al.*, 2020; Yao, 1999; Ilter, 2017; Wisker *et al.*, 2019), personal values (Camfield and Franco, 2019b), ethical values (Driscoll *et al.*, 2019), moral and social values (Sorenson, 2013; Neal and Vallejo, 2008), and cultural values (Zwack *et al.*, 2016; Anggadwita *et al.*, 2019), all indicating the universal dimension (Karakas, 2008) of what it means to be a values-driven organization.

According to Neal and Vallejo (2008), family businesses can serve as incubators for conscience-based moral and social values. Simon and colleagues (2012) refer to previous research, such as that of Hall, Melin, and Nordqvist (2001), to investigate how values prevail in the context of complexity found in family firms. Hall, Melin, and Nordqvist (2001) identify values as implicit or explicit conceptions of what is desirable for both the family and the family business. Family businesses are much more likely to be values-driven, making them a good incubator for developing explicit spiritual values in the workplace (Neal and Vallejo, 2008). As a result, what could be precarious, according to Bruck *et al.* (2018), is that the family aims to secure its interests through the firm. These desires may not necessarily be financial; they are also articulated in emotional terms. Thus, the decisions of families can be inaccurate or selfish. To provide a foundation regarding what is desirable both for the family and the family business, Simon *et al.* (2012) draw attention to Parada and Vilad s (2010), who state that having firm values is one of the sources of growth and survival for a family business. A firm’s governance is heavily reliant on the presence of values. Values are prioritized in families in order to foster long-term relationships, individual growth, and positive human relationships (Morris *et al.*, 1997).

Spiritual values, according to Neal and Vallejo (2008), are the most important factor in defining firms that embrace the transcendental dimension to the same degree as economic values. In any social organization, values can be considered emotional and spiritual resources, especially when they appeal to a person’s sense of morality and aspirations (Sorenson, 2013).

Third thematic group: Spiritual Motivation Theme

Why is there such a growing interest in the spiritual aspect of the workplace? One explanation is that, as society progresses in terms of leisure time, technology, and idea communication, people want to experience spirituality not only in their personal lives but also at work, where they spend a significant amount of time (Klenke, 2013). Another answer to this question could be the benefits to an organization of encouraging workplace spirituality. In other words, there is evidence that suggests a link between workplace spirituality and increased individual creativity, honesty, and trust within the organization, as well as people’s commitment to organizational goals.

For a variety of reasons, the apparent emerging need to comprehend the characteristics and dimensions of spirituality at work is timely. Karakas (2008) describes this trend by examining corporate layoffs and downsizing, increasing employee vulnerability, seeking meaning at work, interest in New Age and Eastern philosophies, and the decline of traditional support networks and groups, as well as ethical scandals.

Regarding succession in family firms, the perpetuation of values and the intention for a family to remain in business are among the paramount aims of business founders (Cruz, 2013). Traditionally, the succession process aims to educate potential successors about how things are done and to help them understand the founders' values and principles (Steier, 2001). To pass down in-depth firm-related tacit knowledge and values, family business founders or owner-managers may focus on lengthy and often informal socialization or interaction processes (Cabrera-Suárez *et al.*, 2018; Discua *et al.*, 2014). The goal is to allow commonly held values to establish a sense of identity, guide decisions, and facilitate organizational commitment (Duh *et al.*, 2010).

While a value-driven owner may be generative (Zacher *et al.*, 2012) and a leader's spiritual orientation may be productive (Klenke, 2013), the leader's spirituality, if not well managed, may cause friction. Cavanagh (1999) contends that some CEOs are so enthralled by their spiritual convictions that they may resort to coercion when they insist others adhere the CEO's religious faith, while favoritism surges for those with similar views.

Fourth thematic group: Spirituality Development Theme

Despite significant conceptual growth, the editors and contributors argue that the study of spirituality in business dynamics must still demonstrate its impact in order to be recognized as a valid discipline in the field of organizational science. The need to discuss corporate life empirically goes hand in hand with the initial efforts to consider spirituality through theoretical espousal, as evidenced by the journal issues mentioned above. According to Hill, Jurkiewicz, Giacalone, and Fry's (2013) "From concept to science: Continuing steps in workplace spirituality research," the systematic scientific study of spiritual components has begun to flourish. Nonetheless, Case and Gosling (2010: pp.260) argue that "there is a general lack of acknowledgment of the continuing epistemological dispute in organization and management studies concerning paradigm incommensurability." To legitimize spirituality in the workplace, an actual positive impact on the part of spiritual variables on business operations was required. Without these facts, the issue of spirituality in the workplace will be dismissed as merely a philosophical and unrealistic endeavor.

Another emerging trend in the field is the adoption of business practices that promote the incorporation of spirituality into organizations (Pfeffer and Salancik, 2003) or the recognition of the coexistence of spirituality and business. Freshman (1999: pp. 319) quotes an entrepreneur who says "The only thing spiritual about my work is the bottom line" to capture what people think in the early literature about organizational spirituality. Traditional capitalism subscribes to the "separation thesis" (Kavas, 2020) between the primary economic roles of business and the larger interests of social justice,

environmental protection, and moral change. A socially responsible company, on the other hand (Izzo and Ciaburri, 2018), overcomes this dichotomy by incorporating uneconomic values into “one bottom-line,” in which “profits” concurrently represent and support “principles.” Cavanagh (1999) emphasizes what previous studies have claimed: the separation of science and spirituality separates people from one another, from nature, and from the divine. Spiritual integration has evolved into a strategic paradigm that articulates the complexities and transformative potential of combining “profits” and “principles” or “economic logic” and “spiritual logic.”

Given the historical emphasis on agency and its rich contextualization, it is not surprising that some studies have focused on the emotional lives of family business leaders (Wong *et al.*, 2018). Socioemotional wealth (SEW), a term defined by Gómez-Meja and colleagues (2007: pp.106) that refers to the “non-financial aspects of the firm that meet the family’s affective needs, such as identity, the ability to exercise family influence, and the perpetuation of the family dynasty,” is another eye-catching area of research in the family firm spirituality literature. Rafaeli (2013) argues that the “affective revolution” in organizational studies should be extended to the research domain of family businesses.

Fifth thematic group: Spiritual Diversity Theme

The articles in this group examine how and why spirituality and values differ across different types of family businesses, as well as how they relate to the succession process. According to Simon *et al.* (2012), who describe the complexity of the family firm, differences in values are influenced by the current characteristics of family members; the peculiarities of the family business; and historical factors such as succession (Bizri, 2016), socialization (Bika *et al.*, 2019), or other processes of value transmission (Cabrera-Suarez, 2005; Zwack *et al.*, 2016; Barbera *et al.*, 2019; Flory *et al.*, 2010).

The dominant values and traditions observed with respect to gender (Collins *et al.*, 2014; Gherardi and Perrotta, 2016; Balaine, 2019) and generational diversity significantly enrich the family firm spirituality and succession literature (Shen, 2018; Bika *et al.*, 2019; Eze *et al.*, 2020; Zellweger *et al.*, 2012). This work begins to create disputes between specific family values, such as fairness principles for children of any gender, because these principles are perceived to be at odds with corporate reality and geared toward gender-based social stereotypes (Nelson and Constantinidis, 2017). An example of this is the feasibility of primogeniture, the normative assumption that the eldest son will control the family business in the next generation. This feudal rule, according to Nelson and Constantinidis (2017), is a monolithic expectation that is being questioned and challenged. They support an egalitarian view of gender over a patriarchal one, favoring gender equality (Ramadani *et al.*, 2017; Ferrari, 2019). Their proposal is that family firms should practice succession planning and ascendancy using mixed-gender teams that share ownership, power, and influence.

Critical Reflections on Spirituality as a Management Tool

Freshman (1999) argues that workplace spirituality elicits a wide range of public perceptions, both positive and negative. In this section, we present three articles that demonstrate critical reflection on the following: 1. the instrumentality of workplace spirituality (Case and Gosling, 2010), 2. organizational spirituality as a form of “symbolic violence” (Kamoche and Pinnington, 2012), and 3. the limitations of business spirituality (Cavanagh, 1999).

Case and Gosling (2010) are vehemently opposed to any social technologies that treat the human being as a mere resource (bodily, emotional, mental, or spiritual) to be deployed in the service of economic profit-making. This is consistent with Hicks (2002), who argues that employees should not be treated as merely another input into the manufacturing process. According to Case and Gosling (2010), studies on workplace spirituality show that companies embrace the spiritual dimension to gain a competitive advantage (Neal and Vallejo, 2008; Madison and Kellermanns, 2013) through what could be considered the appropriation of employee spirituality for primarily economic ends. Gull and Doh (2004) agree that using spirituality as a strategy for the sole purpose of gaining a competitive advantage is irrational and exploitative. However, this case could occur not only as a result of how an organization treats its employees, but also through “reverse instrumentalism,” in which employees use the workplace as a venue for pursuing their spiritualities.

Kamoche and Pinnington (2012), while drawing on Pierre Bourdieu’s critical sociology, investigate how organizational spirituality is being framed as a new way to manage people. Their article takes a critical look at how much of the literature prescribes spiritual values, with the underlying premise that spiritually infused human resource practices, among other things, improve organizational performance. Their work demonstrates how “symbolic violence,” described as an invisible form of violence and dominance coated with moral and spiritual attributes, can be used as an analytical tool for the researchers to use in uncovering the genuine motives behind the organizational adaptation of spirituality. This critique identifies that the top-down approach to organizational spirituality using the “power of pedagogy” is employed to gain the active consent of organizational members, which leads to the deceptive notion to managing one’s spirituality.

Cavanagh (1999) emphasizes the limitations of business spirituality while affirming that it allows a businessperson to gain a more integrated perspective on their firm, family, neighbors, community, and self. Spirituality has increased dramatically among those who study, teach, and write about business management. This renewed interest is also evident among practicing executives. On the other hand, considering the theoretical trend, he identifies the lack of connection between two parallel fields with similar goals and inspirations: business ethics and business spirituality. One explanation for this, he claims, is that religion, while a source of traditional spirituality and inspiration, has historically been a minor source of business ethics.

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5. Discussion and conclusion

The intersection between the two main constructs, succession and spirituality, is shown through its five main themes and two sub-themes, which synthesize the content of the sampled articles. The overlapping relationships between these themes lead us to interrogate the contemporary definition of “succession.” The results show that succession, when viewed from a spiritual lens, seems to exceed the traditional conception of continuity of ownership and management because, along with these two fundamental components, the transcendental element of values is also important. Values that come from authentic spiritual adherence serve both as a means of strategizing succession and as a subject of transmission.

The SLR findings highlight the fact that family firms are known to exhibit values-based behavior (Barbera *et al.*, 2019) and play a key role in unleashing the universal values embedded in every person, which can lead to improved decision-making quality by enabling consistent and goal-congruent decision support and performance measurement (Bruck *et al.*, 2018). In the family business literature, there is a strong consensus on how values play an essential role in shaping an individual’s personal and professional ethos (Treviño *et al.*, 2006) and his decision-making skills and behavior in the business context (Wang and Hackett 2016). Although not all family firms have the potential to be supportive of spirituality in the workplace, Neal and Vallejo (2008) propose that family firms typically possess specific cultural characteristics that stimulate the development of spirituality in the workplace, and Astrachan *et al.* (2020) acknowledge family firms as an especially values-driven form of organization. The literature shows that the theme of values impacting family, business, and individual decisions continues to emerge (Koiranen, 2002; Simon *et al.*, 2012; Zwack *et al.*, 2016; Bruck *et al.*, 2018; Camfield and Franco, 2019b) in relation to the pursuit of diverse family firm goals, in which succession issues remain to be regarded as the most critical stage of development in family-owned enterprises (Morris *et al.*, 1997; Cabrera-Suarez, 2005; Janjuha-Jivraj and Spence, 2009; Maciel *et al.*, 2015; Mathews and Blumentritt, 2015; Bizri, 2016; Merchant *et al.*, 2017; Bozer *et al.*, 2017).

This SLR offers a panoramic view of the spiritual element of a family firm, adopting a polyhedral perspective on succession. Such a comprehensive overview is missing from the family firm literature. Our main objective was to capture this spiritual element’s impact on business dynamics, particularly succession. The five themes explored above address the underlying rationale behind the critical developments in the spirit at work, address their strengths and weaknesses, and indicate where future research should go. This process allows us to identify potential research questions that are worthy of investigation (see Table 5).

The introductory section led us to understand the “what,” “why,” and “how” (Krishnakumar and Neck, 2002) of spirituality in the workplace, as perceived in decade-long studies after it was first introduced to the research community as a management variable (Neal and Vallejo, 2008). We find it increasingly opportune to offer a key to answering the same questions by focusing on family firms, which Neal and Vallejo (2008)

define as “incubators of spirituality” in view of succession. Therefore, the following section provides a road map for pursuing a spiritually enlightened succession process and management through the overlapping correlations of the five main themes.

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Tab. 5: A Research Agenda Toward Spirituality-based Succession

Theme	Suggested Research Questions and Theoretical Perspectives
Spirituality and Context	
a. Spirituality and Religion	<i>Perspectives: Spiritual Leadership Theory, Stewardship Theory, Relational Leadership Theory</i>
	<ol style="list-style-type: none"> 1. How does a principle-based approach to management affect succession? (Christian Values) 2. What are the management tools that will support a rule-based perspective on succession? (Islamic Code of Behavior) 3. Do more religious parents have more cohesive family relationships? 4. What religious values are necessary for an effective transition? 5. Do successors have resistance to a spirituality espoused by the predecessor?
b. Spirituality, Cultural and Geographical Context	<i>Perspectives: Grounded Theory, Resilience Theory, Social Identity Theory</i>
	<ol style="list-style-type: none"> 1. Is effective succession a culturally influenced process? 2. What cultural attributes significantly influence the passage of leadership? 3. Does the political ideology of the family owners in a particular location affect the succession process? 4. How do the unique cultural characteristics of a specific group maintain or destroy business continuity? 5. Does the process of succession that ethnic family businesses adopt reflect their cultural heritage?
Spirituality and Values	<i>Perspectives: System Theory, Strategy-as-Practice Theory, Authentic Leadership Theory</i>
	<ol style="list-style-type: none"> 1. In which part of the succession process are family values highly manifested? 2. How does one ensure that family values or spiritual orientation are passed on from generation to generation? 3. During transgenerational passage, are spiritual family values considered to have the same weight as economic values? 4. Is the selection of a successor linked to his or her values? 5. When do spiritual values become a hindrance to succession?
Spirituality Motivation	<i>Perspectives: Theory of Planned Behavior, Prospect Theory, Resource-Based Approaches</i>
	<ol style="list-style-type: none"> 1. What stimulates the predecessor to accept their responsibilities and stay in the family firm? 2. In the incoming leaders' training process, what spiritual dimension must be instilled in him/her? 3. What are the determinants of a spiritually motivated predecessor? 4. What are the assumptions and aspirations of future generations of successors that shape their intention to join the company? 5. How does the working environment influence the motivation of the predecessor to propel succession?
Spirituality Development	<i>Perspectives: Unification Theory of Succession, Spiritual Leadership Theory, Leader-Member Exchange Theory</i>
	<ol style="list-style-type: none"> 1. What are the contributing factors that render the succession process challenging in terms of finding the equilibrium between family firms' economic and spiritual/values dimensions? 2. How does the incoming leader reconcile his/her spiritual orientation in the workplace concerning what is found or left behind by the outgoing leader? 3. How does a spiritually oriented leader effectively manage the organizational change brought about by transition while remaining faithful to tradition and being open to innovation?
Spiritual Diversity	<i>Perspectives: Theory of Matriarchy, Succession Theory, System Theory</i>
	<ol style="list-style-type: none"> 1. Is the principle of primogeniture a reflection of a spiritually rooted family firm? 2. What method should be used to effectively transmit values and a sense of legacy from one generation to another, without taking for granted the complexity of a leader as a person and his/her relationship to the larger community? 3. Is transgenerational passage the same across enterprises of different sizes?

Source: Authors' elaboration

The New “What” of Spirituality in Family Firms (The Meaning)

Scholars argue that family firms, as complex organizational structures, provide fertile ground for defining the spiritual dimension (Astrachan *et al.*, 2020). As mentioned above, family firms are known to exhibit values-based behavior (Barbera *et al.*, 2019) that is transmitted across successive generations (Flory *et al.*, 2010). In their study of within-family succession, Grundström and colleagues (2012) identify its various aspects, which tend to indicate that the values unique to family-owned enterprises influence its efficiency and succession. These influences have subsequently shaped how transgenerational entrepreneurship is fostered or disrupted by the introduction of a specific firm's practices (Eze and colleagues, 2020). Marriage arrangements (Eze *et al.*, 2020), the role of women (Collins *et al.*, 2014; Ramadani, 2017; Ferrari, 2019), risk-taking orientation, and the feasibility of primogeniture are just a few of these succession dimensions (Eze *et al.*, 2020) and situations in which children may be unwilling to take over the firm (Grundström *et al.*, 2012). What we have emphasized up to this point is the twofold role values play in family firm succession, as evidenced in this study: 1. values as a subject of transmission alongside ownership (Discua, 2014; Barbera *et al.*, 2019) and 2. values as a tool for succession management (Oudah *et al.*, 2018). These roles demonstrate how the spiritual values of the family shape, on the one hand, the degree of solidarity within the family, and, on the other hand, values-driven leadership across generations that extends beyond the workplace.

The New “Why” of Spirituality in Family Firms (The Benefits)

Critical reflections on the approach of “using” spirituality provide us with the key to addressing it from a person-centered standpoint (Morris *et al.*, 1997). This method, according to Gupta *et al.* (2011), is carried out through an encounter that results in cultural change in company decision-making and behavior, rather than using spirituality as a tool to solve motivation and productivity problems. As previously stated, the growing interest in organizational spirituality is characterized by people seeking a way to connect their professional lives (Trevino *et al.*, 2006) with their spiritual lives, as well as individuals seeking greater meaning (Giacalone and Jurkiewicz 2003; Dunchon and Plowman 2005; Gotsis and Kortezi, 2008) that goes far beyond making money (Miller, 1998). Despite the emphasis on succession planning and heir preparation (Bizri, 2016), it appears that the primary goal of the family business owner (Németh *et al.* 2017) should be to establish trust (Cater *et al.* 2014; Dede and Ayranci, 2014), bridge intergenerational communication barriers (Leiß and Zehrer, 2014), and foster shared values among family members (Bizri, 2016).

These benefits derived from recognizing spiritual elements, without reducing them to any form of “symbolic violence” (Kamoche and Pinnington, 2012) or instrumentalizing them (Case and Gosling, 2010) for sole economic ends, lie in emphasizing the person (Morris *et al.*, 1997) as a spiritual being in the workplace, which contradicts studies that addressed spirituality itself and its reverberation in the business environment, as evidenced by Western and pro-capitalist orientations (Wong *et al.*, 2018).

The New “How” of Spirituality in Family Firms (The Way to Implement)

Nemeth and colleagues (2017) contend that family-owned businesses are more complex than non-family businesses due to the interaction of family and business systems (Bertrand and Schoar, 2006). Our research identifies one of the major approaches that the business spirituality literature provides for use in dealing with this unavoidable phenomenon that is unique to family businesses. It depends heavily on managing complexity through the empowerment of stewardship (Simon *et al.*, 2012) among leaders as a result of the presence of pro-organizational and collectivistic behaviors rather than merely individualistic or “self-serving” behaviors (Del Giudice *et al.*, 2013). Paterson and colleagues’ (2013) report summarizes what governance means in a family business dynamic where spirituality is recognized, which is a steward role. Using the respondent’s phrase, “we do not push it on people” (Paterson *et al.*, 2013). The other approach is based on the framework proposed by Douglas Hicks, Respectful Pluralism. It underlines that the task of effective organizational leadership is not to promote a single spiritual framework but, rather, to create a structure and culture in which leaders and followers can respectfully negotiate religious and spiritual diversity (Hicks, 2002). Although the approach of respectful pluralism allows a high degree of expression at work, it must also create limits on personal expression (religious, spiritual, or otherwise) based on whether or not other employees experience coercion or degradation based on another employee’s expression (Gotsis and Kortezi, 2008).

As a family business grows and becomes more complex, a clearly defined set of procedures becomes imperative. To respond to the call for a multi-perspective examination of leadership succession and embrace the dynamic and complex nature of succession in a family business, this paper offers these three approaches through the lens of spiritually oriented leaders.

6. Implications and limitations of the study

The main findings suggest that spirituality serves as a means of strategizing succession, as well as a subject of transmission, through an authentic recognition of the spirituality innate in every person. These results may have implications for both managerial theory and practice. Regarding the theoretical contributions, which focus on strategizing on succession, the findings contribute to family business studies by addressing the role of spirituality and values in family firm succession, as well as by organizing the fragmented literature of the last 30 years, which produced five thematic groups. Indeed, the paper provides a comprehensive overview of research trends on spirituality and succession in family businesses in terms of context, values, motivation, development, diversity, and critical reflections on spirituality as a management tool. By mapping the literature across family firm spirituality and succession, this project also provides a unique perspective on the topic by shedding light on why family firms recognize or do not recognize spirituality at work, what this spirituality entails, and how family firms use spirituality without instrumentalizing it. Through recognizing that the approaches to accurately measuring the

impact of spirituality could be compelling, the thematic literature map provides scholars with a comprehensive and challenging research agenda regarding the seminal measurable determinants of the impact of spiritually guided organizations on the process of succession. Simultaneously, our paper provides a detailed overview of the theoretical underpinnings used by the family business literature to interpret spirituality in family firms, as well as the theoretical rationales used to explain each thematic issue, providing a finer understanding of the phenomenon under investigation. Finally, the research agenda, which contains research questions, as well as the proposed techniques, stimulates a more thorough integration of relevant theoretical approaches to advancing succession and spirituality research.

The paper also has practical implications for those involved in management and ownership succession (i.e., family business owners, entrepreneurs, professional advisors, and the organization as a whole) to address the fundamental role of spirituality as a subject of transmission. Values derived from authentic spiritual adherence serve both as a means of strategizing on succession and as something to be passed across generations. For family business owners, the focus placed on the values of the family and business that constitute common ground can facilitate the transition process between predecessor and successor and foster encounters that connect tradition and innovation. If each generation of the predecessor and successor enter into a formal collaboration and co-create business policies, praxis, and vision updates that express the family values in business, the reciprocity between family and business will be maintained using spiritual values. Without ignoring generational differences in terms of preferences for different values, these values' continuity across generations is maintained when the owning family has special occasions to celebrate values in both family and business.

The study's main drawback is related to the dataset, which included only articles, intentionally excluding books, chapters, proceedings, and other sources. Those sources can be considered for future studies. Moreover, this study focused on spirituality in family firms and its repercussions on succession. Although this was our main goal, focusing only on the predecessor-successor relationship limited our ability to consider the bigger picture of the organization, which involves its various stakeholders. The study also fails to identify family spiritual values' attributes and how the predecessor and successor bring these into business activities. Despite the fact that future studies can contribute to filling the mentioned gap, including the consideration of Scopus data to complement the data search, this does not reduce the relevance of this study, which offers several potential ways to understand the what, why, and how of spirituality in family firms.

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Appendix

Tab. 6: List and Distribution of Journals

Journal of Business Ethics	10
Journal of Management, Spirituality and Religion	9
Family Business Review	8
Journal of Family Business Management	8
Journal of Family Business Strategy	6
Journal of organizational change management	4
The Leadership Quarterly	4
International Journal of Gender and Entrepreneurship.	3
International Journal of Entrepreneurial Venturing	2
International Small Business Journal	2
Journal of Business Venturing	2
Journal of Entrepreneurship in Emerging Economies.	2
Academia Revista Latinoamericana de Administración	1
Ageing and Society	1
Asia Pacific Journal of Management	1
Business History	1
Cambridge Journal of Regions, Economy and Society	1
Cogent Social Sciences	1
Corporate Communications: An International Journal.	1
Cross Cultural & Strategic Management Journal	1
Economic Research-Ekonomska Istraživanja	1
Entrepreneurship Theory and Practice	1
Entreprises et histoire	1
EuroChoices Journal	1
European Planning Studies	1
Gender in Management: An International Journal.	1
Handbook of the psychology of religion and spirituality	1
HTS Theological Studies	1
International Entrepreneurship and Management Journal	1
International Journal of Entrepreneurial Behavior & Research.	1
International Leadership Journal	1
Journal of Asia Entrepreneurship and Sustainability	1
Journal of Banking & Finance	1
Journal of Beliefs and Values	1
Journal of Biblical Integration in Business	1
Journal of Business & Economics Research	1
Journal of Business and Management.	1
Journal of Business Finance & Accounting	1
Journal of Corporate Finance	1
Journal of economic perspectives	1
Journal of Family and Economic Issues	1
Journal of Human Values	1
Journal of Institutional and Theoretical Economics	1
Journal of Islamic Marketing.	1
Journal of Management & Organization	1

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Journal of Management Control	1
Journal of Management Education	1
Journal of managerial psychology	1
Journal of Public Affairs	1
Journal of Small Business and Enterprise Development.	1
Kybernetes	1
Leadership Journal	1
Management Learning	1
Organization Development Journal	1
Organization Science	1
Procedia-Social and Behavioral Sciences	1
PURUSHARTHA- A journal of Management, Ethics and Spirituality	1
Quality & Quantity	1
Social Behavior and Personality: An international Journal	1
Social Responsibility Journal	1
Strategic Management	1
Sustainability Journal	1
The Journal of Asian Finance, Economics, and Business	1
The Journal of Entrepreneurship	1
The Quarterly Review of Economics and Finance	1
The Sociological Review	1
Work, Employment and Society	1
Total	115

Source: Authors' elaboration

Appendix 1. Data Set

#	Year of publication	Author(s) and title	Journal
1	1991	Chau T.T., Approaches to succession in East Asian business organizations.	Family Business Review
2	1996	Kaye K., When the family business is a sickness.	Family Business Review
3	1997	Morris M.H., Williams R.O., Allen J.A., Avila R.A., Correlates of success in family business transitions.	Journal of business venturing
4	1999	Yao X., Confucianism and its modern values: Confucian moral, educational and spiritual heritages revisited.	Journal of Beliefs and Values
5	1999	Cavanagh G.F., Spirituality for managers: Context and critique.	Journal of organizational change management
6	1999	Freshman B., An exploratory analysis of definitions and applications of spirituality in the workplace.	Journal of organizational change management
7	2000	Barnett C.K., Krell T.C., Sendry J., Learning to learn about spirituality: A categorical approach to introducing the topic into management courses.	Journal of Management Education
8	2002	Koironen M., Over 100 years of age but still entrepreneurially active in business: Exploring the values and family characteristics of old Finnish family firms.	Family Business Review
9	2002	Krishnakumar S., Neck C.P., The "what", "why" and "how" of spirituality in the workplace.	Journal of managerial psychology

10	2002	Hicks D.A., Spiritual and religious diversity in the workplace: Implications for leadership.	The leadership quarterly
11	2005	Reave L., Spiritual values and practices related to leadership effectiveness.	The leadership quarterly
12	2005	Dent E.B., Higgins M.E., Wharff D.M., Spirituality and leadership: An empirical review of definitions, distinctions, and embedded assumptions.	The leadership quarterly
13	2005	Cabrera-Suarez K., Leadership transfer and the successor's development in the family firm.	The Leadership Quarterly
14	2006	Bertrand M., Schoar A., The role of family in family firms.	Journal of economic perspectives
15	2006	Fernando M., Jackson B., The influence of religion-based workplace spirituality on business leaders' decision-making: An inter-faith study.	Journal of Management & Organization
16	2008	Gotsis G., Kortezi Z., Philosophical foundations of workplace spirituality: A critical approach.	Journal of Business Ethics
17	2008	Neal J., Vallejo M.C., Family firms as incubators for spirituality in the workplace: Factors that nurture spiritual businesses.	Journal of Management, Spirituality & Religion
18	2008	Karakas F., A holistic view of spirituality and values: the case of global Gulen networks.	Journal of Management, Spirituality & Religion
19	2009	Janjuha-Jivraj S., Spence L.J., The nature of reciprocity in family firm succession.	International Small Business Journal
20	2009	Marschke E., Preziosi R., Harrington W., Professionals and executives support a relationship between organizational commitment and spirituality in the workplace.	Journal of Business & Economics Research
21	2009	Karakas F., New paradigms in organizational development in the 21st century: Positivity, spirituality, and complexity.	Organization Development Journal
22	2010	Case P., Gosling J., The spiritual organization: Critical reflections on the instrumentality of workplace spirituality.	Journal of Management, spirituality and Religion
23	2010	Flory M., Iglesias O., Parada M.J., Vilad�s H., Narratives: a powerful device for values transmission in family businesses.	Journal of Organizational Change Management.
24	2011	Gupta S., Bishnoi N.K., Mathews C., Workplace spirituality & Indian ethos.	PURUSHARTHA- A journal of Management, Ethics and Spirituality
25	2011	Wright M., Kellermanns F.W., Family firms: A research agenda and publication guide.	Journal of Family Business Strategy
26	2012	Zacher H., Schmitt A., Gielnik M., Stepping into my shoes: generativity as a mediator of the relationship between business owners' age and family succession.	Ageing and Society
27	2012	Beekun R.L., Westerman J.W., Spirituality and national culture as antecedents to ethical decision-making: a comparison between the United States and Norway.	Journal of business ethics
28	2012	Simon A., Marqu�s P., Bikfalvi A., Mu�oz M.D., Exploring value differences across family firms: The influence of choosing and managing complexity.	Journal of Family Business Strategy

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29	2012	Grundström C., Öberg C., Rönnbäck A.Ö., Family-owned manufacturing SMEs and innovativeness: A comparison between within-family successions and external takeovers.	Journal of family business strategy
30	2012	Zellweger T.M., Kellermanns F.W., Chrisman J.J., Chua J.H., Family control and family firm valuation by family CEOs: The importance of intentions for transgenerational control.	Organization Science
31	2012	Dewi A.C.E., Dhewanto W., Key success factors of Islamic family business.	Procedia-Social and Behavioral Sciences
32	2012	Kamoche K., Pinnington A.H., Managing people 'spiritually': a Bourdieusian critique.	Work, Employment and Society
33	2013	Hill P.C., Jurkiewicz C.L., Giacalone R.A., Fry L.W., From concept to science: Continuing steps in workplace spirituality research.	Handbook of the psychology of religion and spirituality
34	2013	Klenke K., Integrating leadership and spirituality in the workplace through coalescing values and identity transformations.	International Leadership Journal
35	2013	Mitchell R.K., Robinson R.E., Marin A., Lee J.H., Randolph A.F., Spiritual identity, stakeholder attributes, and family business workplace spirituality stakeholder salience.	Journal of Management, Spirituality & Religion
36	2013	Paterson T.A., Specht D., Duchon D., Exploring costs and consequences of religious expression in family businesses.	Journal of Management, Spirituality & Religion
37	2013	Madison K., Kellermanns F.W., Is the spiritual bond bound by blood? An exploratory study of spiritual leadership in family firms.	Journal of Management, Spirituality & Religion
38	2013	Sorenson R.L., How moral and social values become embedded in family firms.	Journal of Management, Spirituality & Religion
39	2013	Giudice M.D., Peruta M.R.D., Maggioni V., One man company or managed succession: The transfer of the family dream in Southern-Italian firms.	Journal of Organizational Change Management
40	2013	Au K., Chiang F.F., Birtch T.A., Ding Z., Incubating the next generation to venture: The case of a family business in Hong Kong.	Asia Pacific Journal of Management
41	2014	Collins L., Al-Dajani H., Bika Z., Swail J., Smith R., Assessing the contribution of the 'theory of patriarchy' to the entrepreneurship and family business literatures.	International Journal of Gender and Entrepreneurship
42	2014	Discua Cruz A., Christian family businesses: Opportunities for further research.	Journal of Biblical Integration in Business
43	2014	Mussolino D., Calabrò A., Paternalistic leadership in family firms: Types and implications for intergenerational succession.	Journal of Family Business Strategy
44	2014	Cater III J.J., Kidwell R.E., Function, governance, and trust in successor leadership groups in family firms.	Journal of Family Business Strategy
45	2014	Dede N.P., Ayranci E., Exploring the connections among spiritual leadership, altruism, and trust in family businesses.	Quality & Quantity
46	2015	Xi J.M., Kraus S., Filser M., Kellermanns F.W., Mapping the field of family business research: past trends and future directions.	International Entrepreneurship and Management Journal
47	2015	Deng X., Father-daughter succession in China: facilitators and challenges.	Journal of Family Business Management

48	2015	Nguyen B.T., Wait A., Should I Stay or Should I Go? Participation and Decision-Making in Family Firms.	Journal of Institutional and Theoretical Economics
49	2015	Lorandini C., Looking beyond the Buddenbrooks syndrome: the Salvadori Firm of Trento, 1660s-1880s.	Business History
50	2015	Jaskiewicz P., Combs J.G., Rau S.B., Entrepreneurial legacy: Toward a theory of how some family firms nurture transgenerational entrepreneurship.	Journal of Business Venturing
51	2016	Bizri R., Succession in the family business: drivers and pathways.	International Journal of Entrepreneurial Behavior & Research.
52	2016	Keplinger K., Feldbauer-Durstmüller B., Sandberger S., Neulinger M., Entrepreneurial activities of Benedictine monasteries-a special form of family business?	International Journal of Entrepreneurial Venturing
53	2016	Gherardi S., Perrotta M. Daughters taking over the family business.	International Journal of Gender and Entrepreneurship.
54	2016	Asare-Kyire L., He Z., Owusu A., Junaid D., Religious Impact on the Performance of Entrepreneurs: A Comparative Study of Male and Female in Sub-Saharan Africa.	Journal of Business and Management.
55	2016	Zheng V., Wong S.L., Competing for leadership and ownership: the Li & Fung Group's legendary and strategy.	Journal of Entrepreneurship in Emerging Economies.
56	2016	Zwack M., Kraiczy N.D., von Schlippe A., Hack A., Storytelling and cultural family value transmission: Value perception of stories in family firms.	Management Learning
57	2016	Schutte P.J., Workplace spirituality: A tool or a trend?	HTS Theological Studies
58	2017	Ljubotina P., Vadjal J. Succeeding a family business in a transition economy: is this the best that can happen to me?	Kybernetes
59	2017	Wang Y., Wang Z., Influence of new generation succession on team performance: evidence from China.	Social Behavior and Personality: An international Journal
60	2017	Schneider B.R., Unfinished legacy: understanding reciprocity, business groups and MNCs in Latin America.	Cambridge Journal of Regions, Economy and Society
61	2017	Nelson T., Constantinidis C., Sex and gender in family business succession research: A review and forward agenda from a social construction perspective.	Family Business Review
62	2017	Ramadani V., Hisrich R.D., Anggadwita G., Alamanda D.T., Gender and succession planning: opportunities for females to lead Indonesian family businesses.	International Journal of Gender and Entrepreneurship.
63	2017	Shen N., Su J., Religion and succession intention-Evidence from Chinese family firms.	Journal of Corporate Finance
64	2017	Ilter B., Bayraktaroglu G., Ipek I., Impact of Islamic religiosity on materialistic values in Turkey.	Journal of Islamic Marketing.
65	2017	Fry L.W., Latham J.R., Clinebell S.K., Krahnke K., Spiritual leadership as a model for performance excellence: a study of Baldrige award recipients.	Journal of Management, Spirituality & Religion

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66	2017	Bozer G., Levin L., Santora J.C., Succession in family business: multi-source perspectives.	Journal of Small Business and Enterprise Development.
67	2017	Németh K., Ilyés C., Németh S., Intergenerational succession (generational change): Strategic renewal? The emergence of familiness in the business life of Dudits hotels.	Strategic Management
68	2017	Merchant P., Kumar A., Mallik D., The role of quality of relations in succession planning of family businesses in India.	The Journal of Asian Finance, Economics, and Business
69	2017	Joshi M., The transition challenge in family and business: A case study of KL Bricks.	Journal of Family Business Management.
70	2018	Cabrera-Suárez M.K., García-Almeida D. J., De Saá-Pérez P., A dynamic network model of the successor's knowledge construction from the resource-and knowledge-based view of the family firm.	Family Business Review
71	2018	Shen N., Family business, transgenerational succession and diversification strategy.	Cross Cultural & Strategic Management Journal
72	2018	Wong N.D., Smith A., Popp A., Religiosity, emotional states, and strategy in the family firm: Edm. Schluter & Co Ltd., 1953-1980.	Entreprises et histoire
73	2018	Pan Y., Weng R., Xu N., Chan K.C., The role of corporate philanthropy in family firm succession: A social outreach perspective.	Journal of Banking & Finance
74	2018	Mohapatra S., Verma P., Tata as a sustainable enterprise: The causal role of spirituality.	Journal of Human Values
75	2018	Brück C., Ludwig J., Schwering A. The use of value-based management in family firms.	Journal of Management Control
76	2018	Ferry N.C., It's a family business!: Leadership texts as technologies of heteronormativity.	Leadership Journal
77	2018	Izzo M.F., Ciaburri M., Why do they do that? Motives and dimensions of family firms' CSR engagement.	Social Responsibility Journal
78	2018	Oudah M., Jabeen F., Dixon C., Determinants linked to family business sustainability in the UAE: An AHP approach.	Sustainability Journal
79	2019	Bika Z., Rosa P., Karakas F., Multilayered socialization processes in transgenerational family firms.	Family Business Review
80	2019	Murphy L., Huybrechts J., Lambrechts F., The origins and development of socioemotional wealth within next-generation family members: An interpretive grounded theory study.	Family Business Review
81	2019	Anggadwita G., Profityo W.B., Alamanda D. T., Permatasari A., Cultural values and their implications to family business succession: A case study of small Chinese-owned family businesses in Bandung, Indonesia.	Journal of Family Business Management
82	2019	Llanos-Contreras O.A., Jabri M., Exploring family business decline with socioemotional wealth perspective.	Academia Revista Latinoamericana de Administración
83	2019	Ansah M. O., Louw L., Belso-Martinez J., The influence of national culture on organizational culture of multinational companies.	Cogent Social Sciences

84	2019	Ferrari F., In the mother's shadow: exploring power dynamics in family business succession.	Gender in Management: An International Journal.
85	2019	Camfield C., Franco M., The influence of personal values on family firm succession: a structural model.	International Journal of Entrepreneurial Venturing
86	2019	Wisker Z. L., Rosinaite V., Muniapan B., The effect of religiosity, spirituality and family power influence on family business sustainable values.	Journal of Asia Entrepreneurship and Sustainability
87	2019	Bhatnagar N., Sharma P., Ramachandran K., Spirituality and corporate philanthropy in Indian family firms: an exploratory study.	Journal of Business Ethics
88	2019	Dieleman M., Koning J., Articulating values through identity work: Advancing family business ethics research.	Journal of Business Ethics
89	2019	Pieper T.M., Williams Jr R.I., Manley S.C., Matthews L.M., What time may tell: An exploratory study of the relationship between religiosity, temporal orientation, and goals in family business.	Journal of Business Ethics
90	2019	Barbera F., Shi H.X., Agarwal A., Edwards M., The family that prays together stays together: toward a process model of religious value transmission in family firms.	Journal of Business Ethics
91	2019	Tabor W., Madison K., Marler L.E., Kellermanns F.W., The effects of spiritual leadership in family firms: A conservation of resources perspective.	Journal of Business Ethics
92	2019	He W., Yu X., Paving the way for children: Family firm succession and corporate philanthropy in China.	Journal of Business Finance & Accounting
93	2019	Pham T.T., Bell R., Newton D., The father's role in supporting the son's business knowledge development process in Vietnamese family businesses.	Journal of Entrepreneurship in Emerging Economies.
94	2019	Hillebrand S. Innovation in family firms-a generational perspective.	Journal of Family Business Management.
95	2019	Kiwia R.H., Bengesi K.M., Ndyetabula D.W., Succession planning and performance of family-owned small and medium enterprises in Arusha City-Tanzania.	Journal of Family Business Management.
96	2019	Razzak M.R., Jassem S., Socioemotional wealth and performance in private family firms.	Journal of Family Business Management.
97	2019	Camfield C., Franco M., Theoretical framework for family firm management: Relationship between personal values and professionalization and succession.	Journal of Family Business Management.
98	2019	Driscoll C., McIsaac E.M., Wiebe E., The material nature of spirituality in the small business workplace: from transcendent ethical values to immanent ethical actions.	Journal of Management, Spirituality & Religion
99	2019	Camfield C., Franco M., Professionalisation of the Family Firm and Its Relationship with Personal Values.	The Journal of Entrepreneurship
100	2019	Balaine L., Gender and the preservation of family farming in Ireland.	EuroChoices Journal

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101	2020	Bujan I., Entrepreneurial orientation and socioemotional dimensions in small family hotels: do they impact business performance?	Economic Research-Ekonomska Istraživanja
102	2020	Eze N.L., Nordqvist M., Samara G., Parada M.J., Different Strokes for Different Folks: The Roles of Religion and Tradition for Transgenerational Entrepreneurship in Family Businesses.	Entrepreneurship Theory and Practice
103	2020	von Bieberstein F., Crede A.K., Essl A., Hack A., Signaling and Stakeholder Honesty: On the Individual and Combined Effects of Owner Family Membership and Religious Affiliation.	Family Business Review
104	2020	Xian H., Jiang N., McAdam M., Negotiating the female successor-leader role within family business succession in China.	International Small Business Journal
105	2020	Kavas M., Jarzabkowski P., Nigam A., Islamic family business: The constitutive role of religion in business.	Journal of Business Ethics
106	2020	Astrachan J. H., Astrachan C. B., Campopiano G., Baù M. (2020). Values, spirituality and religion: Family business and the roots of sustainable ethical behavior.	Journal of Business Ethics
107	2020	Low J.J., Ayoko O.B., The emergence of spiritual leader and leadership in religion-based organizations.	Journal of business ethics
108	2020	Mendez O.J.M., Maciel A.S., Dark side of the family business: an exploratory perspective.	Journal of Family Business Management.
109	2020	Samara G., Family businesses in the Arab Middle East: What do we know and where should we go?	Journal of Family Business Strategy
110	2020	Harris P., Ozdemir O., Turkish delight a public affairs study on family business: The influence of owners in the entrepreneurship orientation of family-owned businesses.	Journal of Public Affairs
111	2020	Chou S.C., Shih C.J., Like father, like son? Diversification decision and related performance of family firm successors-Evidence from Taiwan.	The Quarterly Review of Economics and Finance
112	2020	Sklair J., Glucksberg L., Philanthrocapitalism as wealth management strategy: Philanthropy, inheritance and succession planning among the global elite.	The Sociological Review
113	2020	Giménez E.L., Novo J.A., A theory of succession in family firms.	Journal of Family and Economic Issues
114	2020	Lenz R., Glückler J., Same same but different: regional coherence between institutions and policies in family firm succession.	European Planning Studies
115	2020	Zehrer A., Leiß G. (2020). Intergenerational communication barriers and pitfalls of business families in transition-a qualitative action research approach.	Corporate Communications: An International Journal.

City in the loop: assessing the relationship between circular economy and smart sustainable cities

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Abstract

Research frame: The concept of a smart city is closely related to sustainability. The circular economy is one of the most interesting facets of the latter. Nevertheless, no substantial effort has been made so far to establish the link between the circular economy and smart cities.

Purpose of the paper: Through the conceptual systemic perspective and quantitative means, the study investigates how the concepts of the smart sustainable city and the circular economy are interconnected.

Methodology: After assessing the related scholarly literature to highlight the systemic nature of the connection between a smart sustainable city and a circular economy, we analyze the relationship between the two by operationally quantifying both concepts on the macro level and the level of the single components of smartness and circularity. Operationalizations are based on the relative frequencies with which certain EU cities are mentioned in scholarly documents related to smartness and the circular economy and indexed on Google Scholar. Regression analysis and principal component analysis are used as the main analytical tools.

Findings: We find a significant positive relationship between a city's smartness and circularity. While the presence of specific smart city-related technologies like AI, Big Data, and IoT are less important for the proliferation of circular economy initiatives in a city, the same is not true for the overall presence of an advanced ICT infrastructure. Alternatively, waste management is the element of the circular economy that contributes the most to sustainable urban smartness.

Research limits: The analysis is performed on a dataset consisting of 193 EU cities. Therefore, the results cannot be applied to cities outside the EU. Moreover, the indices that operationalize sustainable smartness and circularity are empirically valid but require more in-depth statistical validation.

Practical implications: The study suggests city managers and administrators to treat the smart sustainable city concept holistically. Indeed, circular economy initiatives could significantly affect the implementation of smart sustainable urban initiatives.

Originality of the paper: Although the literature treats the two concepts extensively, no attempts to quantify the relationship between smart sustainable cities and circular economy have been made until now. We hope this study will shed additional light on the complex systemic nature of the investigated domains.

Key words: smart city; smart sustainable city; circular economy; Google Scholar, city management

1. Introduction

The development of an urban area is intrinsically related to the rate of its investment in the implementation, use, and expansion of smart technologies (European Commission, 2010; Gouvea *et al.*, 2018). The effective disposition and use of smart technologies can increase the innovative growth rate of cities (Gouvea *et al.*, 2018). Furthermore, these technologies are the binding elements of urban sustainability (Gouvea *et al.*, 2018; UNECE, 2015). The role played by smart technologies such as ICT, AI, IoT, and Big Data (Nica *et al.*, 2020; Bifulco *et al.*, 2016; Quan *et al.*, 2019; Bibri, 2018) in the development of smart sustainable cities cannot be underestimated (European Commission, 2010). Nevertheless, in discussing sustainability and smartness - and consequently sustainable practices and smart solutions for cities - we should distinguish between sustainable cities and smart cities (Treude, 2021). Recent studies have attempted to incorporate sustainability into the smart city concept to “smarten up” sustainable models used in cities (Al Nuaimi *et al.*, 2015; Batty *et al.*, 2012; Bibri, Krogstie, 2017; Kramers *et al.*, 2014; Neirotti *et al.*, 2014; Shahrokni *et al.*, 2015). One optimal way of doing so consists in defining the pillars of sustainability of a city and assessing smart technologies’ contribution to these pillars.

Moreover, sustainable urban development is not feasible by considering only finite resources and the limited capacity to recycle waste (Bonviu, 2014). Indeed, the natural renovation of resources is not capable of substantial improvements. Consequently, it cannot guarantee sufficient resources for future generations in the light of intergenerational justice principles. Alternatively, an economy based on these principles seeking solutions to the above-mentioned issues functions as a circular economy.

According to a traditional vision, the circular economy also concerns a production and consumption model based on reusing and recycling materials, thus contributing to the extension of the product’s lifecycle (Awuah, Booth, 2014). We can also define the circular economy as a regenerative system in which recycling and renewable energy production methods minimize resource input, waste, emissions, and energy leakage (Geissdoerfer *et al.*, 2017).

The circular economy is beneficial for the creation of more sustainable processes in different areas. In urban development, cities can implement relevant initiatives to turn themselves into sustainable circular smart systems. Although the circular economy’s application in cities is actively encouraged by many scholars, there is a need to measure and analyze its environmental impacts and correlations in relation to other urban matters (Aceleanu *et al.*, 2019).

Although there are many studies within the literature assessing the contribution of sustainability to smart cities and the application of circular economy in pursuing sustainable development goals, there exists a substantial lack of studies that assess the interconnection of elements of these concepts in a concrete manner. Circularity is an integral part of the notion in some definitions of a sustainable smart city. Thus, some researchers might argue that the sustainable smart city intrinsically

includes the concept of circularity. This actually means that the word “circular” can be left out of the definition without any substantial loss. However, there are several reasons why the notion of circularity should be explicitly emphasized.

First, even if some sustainable smart city concepts intrinsically include circularity, this is not the case for all of them, as they do not specifically emphasize circular economy indices. In their study on sustainable smart cities, Kramers *et al.* (2014) argue that only a few definitions include explicit environmental sustainability objectives such as circularity.

Second, there are real cases of technological cities aiming to become smart cities that have failed to solve circularity issues due to linear technology. Or worse, their technological texture has contributed to more pronounced sustainability issues (Hotta, Aoki-Suzuki, 2014).

Third, the analytical mapping of smart cities that was initiated by the EU (Mapping Smart Cities in the EU, 2014) has found that “smart mobility” is the most common aspect of smart cities, which share 21% of all smart initiatives, respectively. Other areas of sustainability within the technological perspective are neglected (Janker, Mann, 2020).

Fourth, none of the present smart city concepts sets up a baseline for circularity and its pillars. Moreover, while a sustainable smart city concept might do just fine without defining circularity, the issue becomes problematic for a smart circular city (Schipper, Silvius, 2019).

In this article, we argue for the importance of circular economy practices in implementing Sustainable Development Goals (SDGs) in Smart Sustainable Cities (SSCs). We present an exploratory analysis of the relationship between the smart sustainable cities concept and the circular economy using data on the 393 most populated urban areas of the EU. In this paper, the concept of smart sustainable cities is addressed from the perspective of smart technologies like AI, ICT, IoT, and Big Data (Nica *et al.*, 2020; Bifulco *et al.*, 2016; Quan *et al.*, 2019; Bibri, 2018). The circular economy is proxied by recurring to the most critical elements of the circular economy related to the smart city concept (Korhonen *et al.*, 2018; Moraga *et al.*, 2019). Besides enriching the currently scarce literature on smart sustainable cities, this study provides policymakers in the urban domain with valuable insights on the dynamics of diverse smart and sustainable development initiatives and their relationship to circular economy principles for EU cities.

2. Theoretical background

2.1 From ‘smart city’ to ‘smart sustainable city’

To outline the smart sustainable city concept, it is necessary to review different available smart city conceptualizations.

It is evident, from the literature review, that there exists no universally accepted definition of the smart city. This is also due to the fact that the concept may be applied in different areas (Schaffers *et al.*, 2012; Zhuhadar *et al.*, 2017; Chong *et al.*, 2018; Ismagilova *et al.*, 2019). In light of the

objectives of this study, a city is considered “smart” when it possesses the characteristics of a complex ecosystem (Lusch, Spohrer, 2012) in which sustainable partnerships and cooperation strategies must be implemented among the main stakeholders (Schaffers *et al.*, 2011). This promotes the sustainable management of the cities’ resources to improve the inhabitants’ well-being and quality of life (Bifulco *et al.*, 2016; Pinna *et al.*, 2017; Ismagilova *et al.*, 2019). These considerations are consistent with the definition of smart city that was formulated by Li *et al.* (2016), who highlight that “smart cities aim to provide a more efficient, sustainable, competitive, productive, open, and transparent place to live”. This is also reflected in the study by Gascó-Hernandez (2018), who believes that “smart city is an umbrella term for how information and communication technology can improve the efficiency of a city’s operations and its citizens’ quality of life while promoting the local economy”. More specifically, “a city is designated as smart if it balances economic, social, and environmental development and if it links up to democratic processes through a participatory government. SC involves the implementation and deployment of information and communication technology (ICT) infrastructures to support social and urban growth through improving the economy, citizens’ involvement, and government efficiency” (Yeh, 2017). From this point of view, it is possible to monitor, understand, verify, evaluate, and plan cities through ICT to improve urban sustainability (Bibri, Krogstie, 2017).

Based on the definitions mentioned above, we can conclude that smart cities aim at sustainable development, which can be implemented through the active participation of the population and the exploitation of available technologies. Accordingly, a smart city and sustainability are interconnected because a non-sustainable city is, by definition, far from being “smart”. However, the concepts of smart city and sustainable city should not be considered synonymous (Ahvenniemi *et al.*, 2017). As highlighted in the study by Ahvenniemi *et al.* (2017), who elaborates on the definition formulated by Castells (2000), “a city can be defined as sustainable if over time its conditions of production do not destroy the conditions of its reproduction”. In this context, since a smart city is considered as a constellation of actors (Treude, 2021), in order to achieve sustainability it is essential to understand all the existing relationships between individuals, and then the social dimension, their activities and so the economic dimension, the environmental dimension, and the cultural dimension (Tregua *et al.*, 2015; B (Tregua *et al.*, 2015; Bibri, Krogstie, 2017; Engel *et al.*, 2018; Martin *et al.*, 2018; Treude, 2021). This is consistent with Akande *et al.* (2019), who argued that in order to implement the concept of a smart sustainable city, stakeholders must use ICT to support environmental sustainability. In this perspective, precise systemic analysis is configured because the objectives of a system can generate consequences for other systems (Barbier, Burgess, 2017).

Although the environmental and social impact of contemporary cities—as regards the exploitation of resources, the production of waste, and the generation of emissions—has been proven, it is essential to address a dynamic value co-creation of a long-term approach based on sustainability (Bulkeley, Betsill, 2005). Moreover, the challenges that cities must face include the

reconfiguration of land management models, and therefore of all available resources, through participatory governance (Caragliu *et al.*, 2011).

As argued by Akande *et al.* (2019), the study of the principles of smart sustainable cities is grounded in the effects and implications of ICT and infrastructure on urban sustainability (Kramers *et al.*, 2014; Al-Nasrawi *et al.*, 2016). This is made possible through the development of integrated frameworks to measure the sustainable smartness of cities (Ahvenniemi *et al.*, 2017).

Previous studies have sought to understand the association between smartness and environmental sustainability using regression analysis. For example, Wu and Raghupathi (2018) performed country-level research to examine this relationship and found that smartness is positively correlated with sustainability and can promote environmental sustainability. However, Higón *et al.* (2017) reported a contrasting result upon identifying a non-linear relationship between technological development and environmental sustainability in an inverted U-curve shape.

In the two following sections, the effect of a circular economy on a city's smartness as a crucial sustainability factor will be measured.

2.2 The application of circular economy models in the smart sustainable city

As can be inferred from findings in the literature, the smart sustainable city qualifies as a concept because, besides satisfying the requirements of a smart city, it relates to a territorial context that uses ICT and sustainable urban development practices to improve the well-being and quality of life of its citizens (Fedele, Romeo, 2020).

To achieve this goal, infrastructure digitization, in particular, should be used to develop circular economy models. Indeed, gathered data should be used to identify “potential productive uses of waste streams in real-time” (Martin *et al.*, 2018). On the other hand, for a sustainable future of cities to unfold, the circular economy can answer the challenges that urbanities face by taking the prescriptions published in 2019 by the OECD (Bibri, Krogstie, 2017; Bonato, Orsini, 2018; Pevcin, 2019; Yigitcanlar *et al.*, 2019) into account. As indicated by Romano *et al.* (2020), “many cities are implementing circular economy strategies to maintain a healthy and regenerative economy, while promoting environmental sustainability and livability. [...]. The circular economy precisely provides the problem context needed for testing, refining, and extending the systems approach in cities. [...]. Cities are concerned with the transition towards the circular economy: first, as already discussed, cities are laboratories for innovation and have the bottom-up entrepreneurial impetus and links to citizens to generate the social, environmental, and economic benefits of such innovations and experimentations, including new forms of businesses and partnerships. Second, considering the increasing trends of decentralization of public services in OECD countries, subnational governments have greater responsibility for local public services such as transport, solid waste, water, and energy, which are key to the well-being of citizens. Third, governance at the urban level focuses on the realities of the city and the impacts of policies on the lives of citizens”.

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The future circularity orientation of smart sustainable cities is desirable for many reasons. For example, waste can be managed to generate new resources and it can even be transformed into resources that take on significantly more than their original value (Thompson, 1979; De Jong *et al.*, 2015; Deakin, Reid, 2018; Yigitcanlar *et al.*, 2019). Circular economic processes can be implemented through the reuse, recycling, and regeneration of materials, production, use of renewable energy, and joint regeneration of cultural heritage and the landscape of cities within a win-win perspective. The circular economy that is applied in smart sustainable cities can be considered a “creative” strategy. Indeed, it integrates the creation of economic value, which is implemented through consonant interactions among companies, environmental protection, and the reduction of social exclusion, starting from the city’s/territory’s historical-cultural roots.

Romano *et al.* (2020) sustain that in order to achieve these goals, it is necessary to apply the 3P model based on:

- coordination between public and private entities, including the business world, in view of the goal of circularity;
- coordination across policies to make sectors complementary through interactions that are appropriately planned during the design and implementation of urban policies;
- coordination across places because different territorial contexts (urban, rural, etc.) should not be considered as isolated systems but rather as global areas in which materials, resources, and products are exchanged.

The authors highlight that “the variety of actors, sectors, and goals makes the circular economy systemic by nature. It implies a rethinking of governance models based on multi-stakeholder and multi-sectoral approaches. For the circular economy to happen, policies need to be aligned, stakeholders informed and engaged, legal and regulatory frameworks updated and supportive of innovation. Also, technical, human, and financial resources need to be adequate; new capacities need to be built; and progress and results need to be monitored and evaluated to stimulate economic growth, social well-being, and environmental sustainability” (Romano *et al.*, 2020).

In the context of the relationship between smart sustainable cities and the circular economy, adopting a systemic approach is also necessary since a multiplicity of actors, sectors, and goals are involved. In this scenario, interdependencies, circular processes, and implemented synergies increase entrepreneurship, resilience, and therefore the growth and development, of smart sustainable cities. Furthermore, smart sustainable cities can be considered vital systems because they act as dynamic, complex systems, that are capable of transforming themselves and adapting to the continuous pressure of change deriving from the external environment. They can also modify their physical structure of space, organization, and functions by combining infrastructures, services, etc., while maintaining their own identity. To face globalized economic competition, energy needs, and ecological-social challenges, smart sustainable cities must produce synergistic and efficient interactions based on circular economic models that stimulate citizens’ creativity (Fusco Girard, 2013; Yigitcanlar

et al., 2019). From this perspective, many European cities have included objectives relating to the transition to a circular economy in their agenda in the attempt to reduce systemic entropy through cultural projects aimed at empowering civil society (Talamo *et al.*, 2019).

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3. Methodology

We devised a quantitative study to investigate the relationship between urban propensity towards smart sustainable city initiatives and circular economy initiatives. The subset of EU cities was selected as the starting point of the analysis. We chose EU cities for two main reasons. Firstly, there exists a certain homogeneity at the supranational level in terms of the types of initiatives, which are typically reified in the form of regulations, directives, decisions, recommendations, and opinions (Gargiulio *et al.*, 2013; Paskaleva, 2011; Domenech, Bahn-Walkowiak, 2019, Hartley *et al.*, 2020). However, such homogeneity is not only legislative; rather, there is also a higher degree of cultural homogeneity among EU Member States due to their geographical proximity and shared burdens of history (Akaliyski, 2017). This is important, as the methodology we propose is not entirely immune to local specificities. By removing the problem of heterogeneous contexts, we hope to render the derived indices comparable across the countries. Secondly, given the status of “developed countries” that is detained by most EU Member States (Rozmahel *et al.*, 2013), EU cities are proximal candidates, as they are both sustainably smart and actively implement circular economy initiatives. To study how these two are interconnected, we need to analyze cities that are currently making substantial progress towards both goals.

A total of 27 countries were selected for the analysis (Great Britain was excluded, given its recent withdrawal from the EU). The dataset we created was built by drawing on the most recent edition of the free-to-use version of the World Cities Database (2020). As stated by the creators of the database, “cities for all non-U.S. countries come from the National Geospatial-Intelligence Agency. [...] The basic population data comes from Natural Earth Data” (World Cities Database, 2020). Overall, we identified 4804 cities within the EU. The number is not exact, as different countries usually have different legislative criteria for distinguishing cities from minor urban centers (Macionis, Parrillo, 2004). Also, the criteria the database creators adopted to define a city is also not clear. Out of 4804 EU cities, we selected urban centers with over one hundred thousand inhabitants as the starting point of the analysis. We realize that this may seem like an arbitrary criterion, and some critical high-tech cities might have been left out of the analysis. However, as most technological innovation and adoption happen inside larger urban areas (Makkonen *et al.*, 2018), the cut-off point of one hundred thousand inhabitants adheres to a strong rationale. 393 such cities were identified in the EU.

The additional gathering of data was performed through the Google Scholar search engine. For each city in the sample, we performed a set of Google searches. All of the searches were performed with the “in-title”

specifier to count frequencies only when a search term appeared in the title of scholarly publications.

First, we used the names in English of each city as search queries. We thus obtained an approximate number of all academic papers and other related scientific literature for each urban center containing the related city names in their titles. We labeled it as *all Google results for a city*. Then, for each city, we carried out additional Google Scholar searches (with the “in-title” specifier) by looking for a city’s name paired with a specific keyword. Each keyword identified a specific technological component of a smart sustainable city or a particular facet of circular economy. We identified four keywords for a smart sustainable city subset (Internet of Things, ICT, Big Data, Artificial Intelligence) and three keywords for a circular economy subset (Waste Management, Renewable Energy, Recycling). While the latter denotes the most critical elements of the circular economy (Korhonen *et al.*, 2018; Moraga *et al.*, 2019), the former identifies the most frequently implemented technologies in smart sustainable cities (López, Bolívar, 2018). We termed the number of Google Scholar results for each of those searches *all ‘keyword’ Google results for a city*, where ‘keyword’ is a specific indicator among the seven that were previously mentioned. To determine related indices that measure a city’s performance in the core aspects of sustainable smartness and circular economy, we applied the following set of formulas to each of the 393 cities in the sample:

$$\text{'keyword' index} = \frac{\text{'keyword' Google results for a city}}{\text{all Google results for a city}}$$

The result consisted in the set of micro indices (Artificial Intelligence index, IoT index, Waste Management index, etc.) measuring how well a particular city is doing in those specific aspects of sustainable smartness and circular economy. Lastly, two additional indices, i.e., *Smart City Google results for a city* and *Circular Economy Google results for a city*, were calculated following the same logic (using “Circular Economy” and “Smart City” keywords). In contrast to the seven aforementioned indices, these two do not measure the amount of academic interest towards specific components of a city’s sustainable smartness and circular economy. However, they served to identify an additional number of articles related to both the smart sustainable city and circular economy aspects of an urban center in order to count the articles that are not identifiable by more specific keywords.

To quantify the overall predisposition of a city towards smart sustainable city initiatives, we applied the following formula:

$$\text{Sustainable Smartness index} = \frac{\sum \text{'smart sustainable city keyword' Google results for a city}}{\text{all Google results for a city}}$$

Where the *smart sustainable city keyword Google results for a city* represent the number of search results for a particular smart sustainable city-related keyword (Smart City, Internet of Things, ICT, Big Data, Artificial Intelligence) paired with the name of an urban center on Google Scholar.

To quantify the general predisposition of a city towards circular economy initiatives, we applied the following formula:

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$$\text{Circular Economy index} = \frac{\sum \text{'circular economy keyword' Google results for a city}}{\text{all Google results for a city}}$$

Where the *circular economy keyword Google results for a city* represent the number of search results for a particular circular economy-related keyword (Circular Economy, Waste Management, Renewable Energy, Recycling) paired with the name of an urban center on Google Scholar.

To eliminate cities introducing a significant distortion in the dataset, we calculated the two macro indices only when the sum of five *'smart sustainable city keyword' Google results for a city* and four *'circular economy keyword' Google results for a city* indices was more or equal to four. The cut-off point was not arbitrarily set but rather derived from an empirical observation: in such cases in fact, the denominator of the formulas was consistently low (which was often true for less known urban centers), and the results were distorted in an upward manner, inflating the significance of a city based on its sustainable smartness or circular economy initiatives. Of the initial 393 cities, the two macro-indices were calculated for 193 cities.

Overall, we considered the population, the two macro indices of Sustainable Smartness and Circular Economy, and the seven micro indices related to the individual components that contribute to a city's sustainable smartness and its circular economy initiatives of each city.

The indices operationalize sustainable smartness and its components, as well as the extent of circular economy initiatives for each specific city. The biggest issue here is understanding how closely an operational definition matches reality. Indeed, it seems that the indices more closely capture the amount of academic interest in different aspects of a city's sustainable smartness and circular economy. Is academic interest correlated with the actual number of smart sustainable city and circular economy initiatives? Do cities with a significant presence of academic institutions generate more Google Scholar searches on average? The methodology, indeed, requires additional statistical validation.

Nevertheless, an empirical observation revealed that cities with a high Sustainable Smartness index have a substantial number of ongoing or planned sustainable smart city projects. This, for example, is the case of Varna, a Bulgarian seaside city scoring the highest in the Sustainable Smartness index. The city is an urban center that substantially invests in sustainable smart city initiatives and has the potential to become one of the first real European smart cities (Kostadinova Popova, Malinova Malcheva, 2020). The second "sustainably smartest" city, as defined by the index, is Funchal, the central city on Madeira Island (Portugal) that is famous for its smart projects for tourism (Rodrigues, Virtudes, 2019). The third "sustainably smartest" city in the dataset is Oulu (Finland), commonly recognized as a critical center of innovation in the EU (Rantakokko, 2012).

The same empirical validation applies to the Circular Economy index, with cities in Poland (Zabrze, Wałbrzych) and Croatia (Split, Płock)-all strategic centers of circular economy initiatives in the EU-leading the list (Zielińska, 2019; Smol *et al.* 2020; Andabaka *et al.*, 2018; Sverko Grdic *et*

al., 2020). The weak point of the methodology is represented by Barcelona, the city that produced the highest number of Google Scholar results related to sustainable smartness and is considered one of the leading European cities in terms of its smart city initiatives (Bakici *et al.*, 2013). Nevertheless, its Sustainable Smartness index is at the end of the first percentile of the related distribution due to the high denominator.

Both macro and micro indices have the apparent advantage of being relative, and thus expressed by pure numbers. This makes the comparison between various cities in relation to such heterogeneous dimensions possible. By definition, the indices vary in the range between zero and one. Zero denotes a city with no related academic literature containing its name in the titles, thus defining the city's lowest possible smartness/amount of circular economy initiatives. One represents an ideal case in which all the academic city-related topics concern either a smart sustainable city and its components or circular economy and its components. It operationalizes the city's highest possible smartness/amount of circular economy initiatives.

To understand how the indices of Sustainable Smartness and Circular Economy are related, we performed regression analysis. The European cities we chose to investigate do not come from a random sample. Therefore, the models in the next section are not applicable to all urban realities. Accordingly, any conclusion herein can be extended to cities in similar contexts and with similar characteristics to major EU cities. On the other hand, not striving for statistical inference simplifies the analysis, as the distribution of residuals is not conditioned by a set of stringent assumptions.

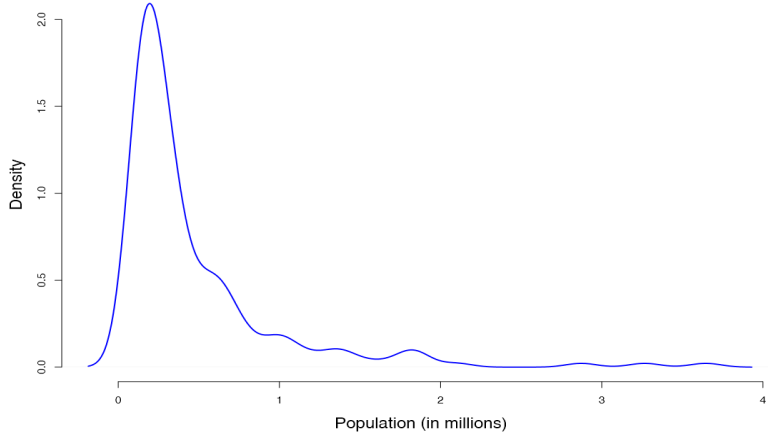
Finally, to understand how the individual components of a smart sustainable city contribute to the number of circular economy initiatives of a city and how different pillars of a circular economy are related to the city's smartness, we analyzed the spatial distribution of indices along the two most significant dimensions of principal component analysis (PCA). The results and their discussion are reported in the following sections.

4. Results

Out of 193 EU cities were identified as potential smart sustainable cities with substantial investments in the circular economy, and the majority have a population of one million or fewer inhabitants. The distribution is asymmetrical and right-skewed, with an average number of inhabitants equal to 0.472 million and a median equal to 0.2783 million inhabitants. The kernel density estimation of the cities' distribution according to their populations (bandwidth = 0.09529) is shown in Figure 1.

Fig. 1: Kernel density estimation of the cities of the dataset according to their populations

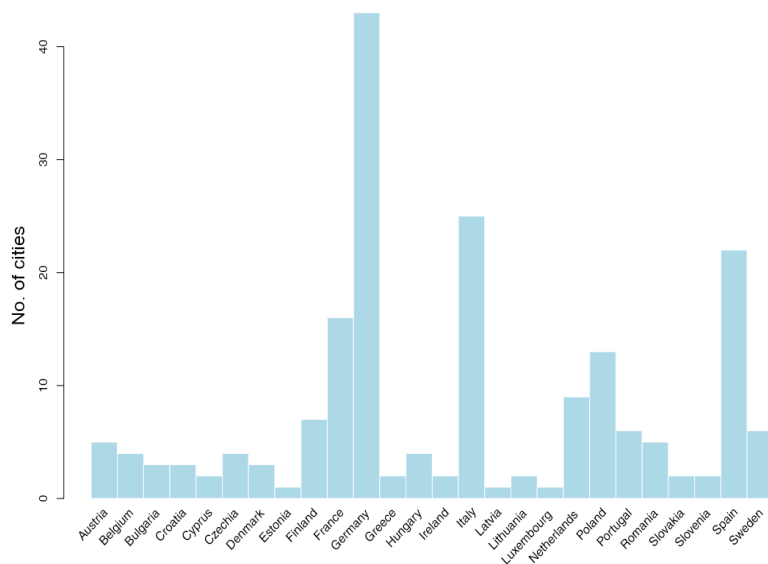
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Source: own elaboration

Of the EU States contributing to the dataset, most cities are German (43), with Italy and Spain taking second and third place, respectively (25 and 22 cities). However, , the numbers reflect the EU Member States’ geographical and demographical composition and underlying socio-cultural aspects more than correlating with the relative amount of smart sustainable city and circular economy initiatives in each country. The bar graph in Figure 2 reports the countries’ distribution within the sample.

Fig. 2: Distribution of countries in terms of the numbers of cities in the dataset



Source: own elaboration

A simple linear regression between the Circular Economy index and the Sustainable Smartness index was performed.

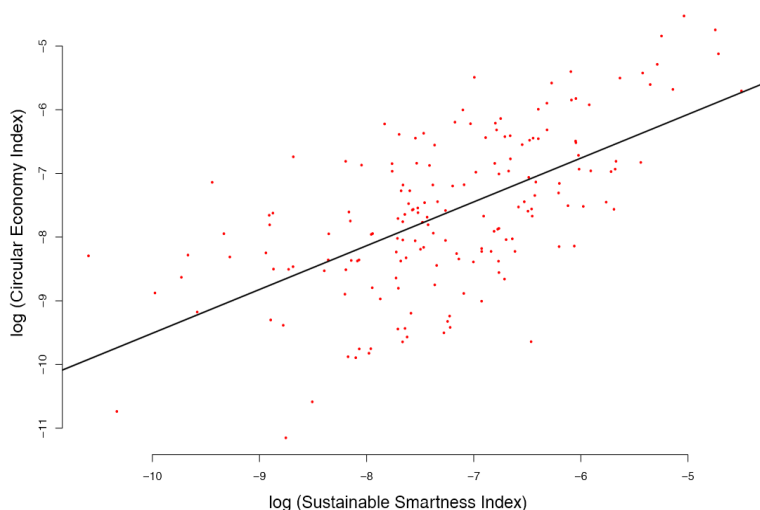
$$\text{Circular Economy index} = 0.0005015 + 0.4571193 * \text{Smartness index}$$

The resulting model revealed the existence of a moderate-to-strong positive correlation between the two indices (p-value for the slope equal to $2.28e-13$). The R-squared index equal to 0.2419 suggests that approximately 24 percent of the Circular Economic index variation is related to the variation of the Sustainable Smartness index. However, due to the relative nature of the indices (varying between zero and one), the interpretation of the above relationship is problematic. To capture the nested dynamic between the indices, we applied logarithmic transformations to both sides and performed another linear regression. The following expression captures the resultant log-log relationship between the indices:

$$\log(\text{Circular Economy index}) = -2.63422 + 0.68755 * \log(\text{Smartness index})$$

The expression, which denotes the relationship between the two indices in terms of elasticity (p-value for the slope equal to $2e-16$), indicates that a 0.68 percent increase in the Sustainable Smartness index is necessary to obtain a percentage increase in the Circular Economy index. Figure 3 shows the scatter plot and the regression line representing the log-log relationship between the indices.

Fig. 3: log-log relationship between the Circular Economy index and the Sustainable Smartness index



Source: own elaboration

Finally, to understand which components of sustainable smartness contribute the most to the Circular Economy index and vice versa, as well as which elements of the circular economy contribute the most to

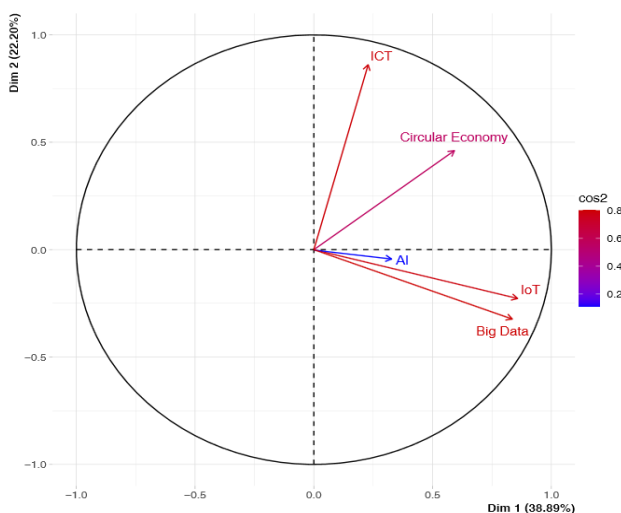
the Sustainable Smartness index, we performed a principal component analysis (PCA).

Firstly, four specific smart city-related indices (Internet of Things index, ICT index, Big Data index, Artificial Intelligence index) and the general Circular Economy index entered the analysis as active variables. The PCA generated five dimensions, with the first two capturing more than 60 percent of the cumulative variance. Figure 4 shows the distribution of variables within the correlation circle. The coordinates of active variables are the squared correlation ratios between each active variable and the two dimensions of the plane; \cos^2 denotes each active variable's quality of representation on the two most significant PCA axes. By analyzing the contribution of variables to the plane's definition, we noticed that they were positively correlated with the first dimension. Alongside the second dimension, however, the ICT index and Circular Economy index were positively correlated, while others were negatively correlated. Accordingly, the first dimension may be defined as the overall propensity towards smart and circular economy initiatives. The second dimension distinguishes between specific indices that are closely related to smart sustainable cities (Artificial Intelligence index, Internet of Things index, and Big Data index), and negatively correlated with the second dimension and the more general indices of Circular Economy and ICT. It suggests that specific technologies like AI, Big Data, and IoT are less important for the proliferation of circular economy initiatives in a city compared to the general presence of an ICT infrastructure.

According to the PCA, cities on the right side of the graph are generally more innovative from the point of view of sustainable smart city initiatives. In Figure 5, the distribution of all the urban centers alongside the two most significant dimensions of the PCA factor map is shown.

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Fig. 4: Squared correlation ratios between individual components of sustainable smartness and the Circular Economy index



Source: own elaboration

Fig. 5: Distribution of individual cities of the dataset along the two most significant dimensions of the PCA



Source: own elaboration

As seen in Figure 5, most of the EU cities in the dataset (clustered around the origin of the axes) rated average in terms of their smart city initiatives. However, some EU cities (on the right) are already very proactive about their smart sustainable future.

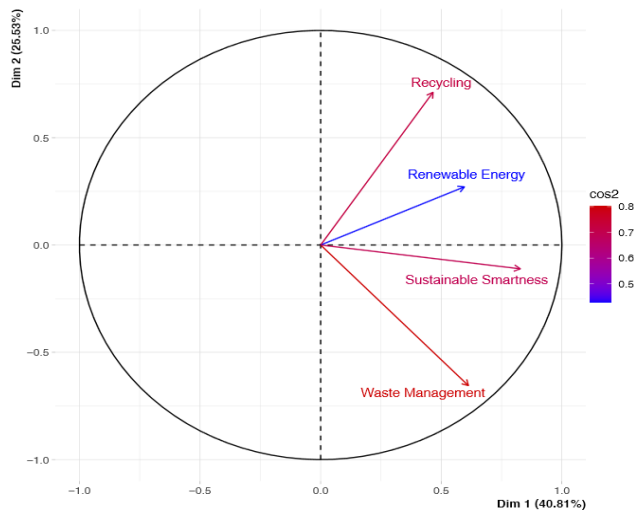
Secondly, three specific circular economy-related indices (i.e. Waste Management index, Recycling index, and Renewable Energy index) and the general Sustainable Smartness index entered the analysis as active variables. The PCA generated four dimensions, with the first two capturing more than 66 percent of the cumulative variance. The PCA graph of the variables inside the correlation circle is shown in Figure 6.

Again, all the variables were positively correlated with the first dimension. As regards the second dimension, the Recycling index and the Renewable Energy index were positively correlated, while the Sustainable Smartness index and the Waste Management index were negatively correlated. Thus, the first dimension may be defined as the general propensity towards smart and circular economy initiatives. We did not manage to find a specific descriptor for the second dimension. However, it clearly shows that the element of the circular economy contributing the most to sustainable urban smartness consists in waste management.

According to the PCA, urban centers on the right side of the graph are generally more innovative in terms of urban circular economy initiatives. The EU cities' distribution alongside the two most significant dimensions of the PCA is shown in Figure 7. Most of the cities in the dataset are clustered around the origin of axes, and therefore perform neither well nor badly in terms of circular economy initiatives. Some cities, however, are very innovative.

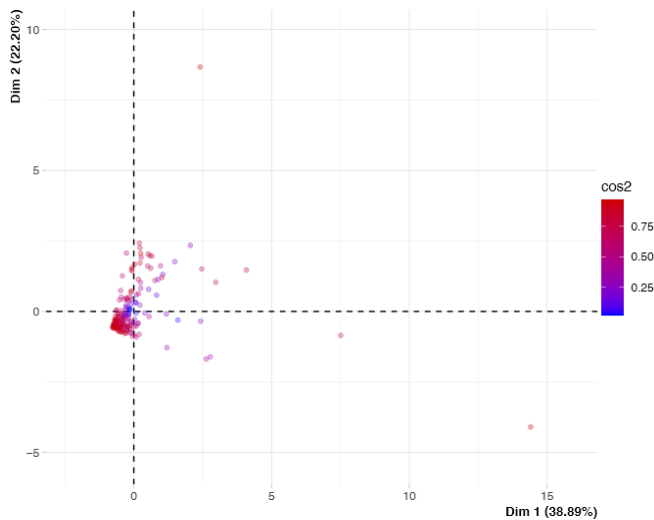
Fig. 6: Squared correlation ratios between individual components of the circular economy and Sustainable Smartness index

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Source: own elaboration

Fig. 7: Distribution of individual cities of the dataset along the two most significant dimensions of the PCA



Source: own elaboration

5. Discussion and conclusions

As can be deduced from the study's results, we may assume that smart cities are also sustainable. Both sustainability and ICT can be viewed as the

two enabling pillars of a city's smartness (Bifulco *et al.*, 2016). The opposite is, however, debatable. For example, we may think of an environmentally sustainable city without a substantial ICT infrastructure. To overcome the issue and shift the focus towards major problems within the literature, some authors recommend using the term "smart sustainable city" (Ahvenniemi *et al.*, 2017). The term elevates both smartness and sustainability to the same conceptual level, making them equally important for researchers. Too often in fact, previous research efforts overlooked the sustainability aspects of urban development, making it the proverbial "elephant in the room". On the other hand, as the first two decades of research on smart cities have revealed, the (more "thrilling") technological aspects were increasingly addressed by scholars. However, those contributions lacked cohesion and were significantly heterogeneous (Mora *et al.*, 2017).

Only recently have sustainability issues in smart cities gained the necessary attention from scholars. Starting from suggestions to rescale the plans of smart cities from large urban realities to eco-friendlier smart villages (Visvizi, Lytras, 2018), proposals of bottom-up smart city initiatives "that facilitate participation and collaboration among city stakeholders" (Veeckman, Van Der Graaf, 2015), and attempts to study the quality of life within smart cities (Coenen *et al.*, 2014), the novel urban literature is thriving with sustainability topics of every kind. The application of circular economy principles to smart cities is undoubtedly part of this trend, as even a brief assessment of the related literature may demonstrate (Petit-Boix, Leipold, 2018; Del Borghi *et al.*, 2014; Aceleanu *et al.*, 2019; Schipper, Silvius, 2019).

The methodology that was developed in the present study allowed us to rank the biggest cities in the EU according to the number of smart sustainable city initiatives and urban circular economy initiatives. Whether the indices of Smartness and Circular Economy perfectly capture the real situation is left to the further analysis of the compatibility between operational definitions of smartness and circularity (as defined by both indices) and the empirical reality. On the other hand, the indices allowed us to rank the cities in the dataset according to a universal criterion. Thus, the indices were not developed as the most precise or proximal. This comes as no surprise, given how heterogeneous the perception of a smart city in the literature is (Yigitcanlar *et al.*, 2018).

The results of the regression analysis are interesting. The moderate-to-strong positive linear relationship between smartness and circularity reveals the close interconnectedness of technology and environmental sustainability. It also confirms the assertion by Bifulco *et al.* (2016) about the importance of sustainability for smart cities. Among the specific technological components of a smart sustainable city, only ICT seems closely related to the Circular Economy index. This makes sense, as the general presence of an ICT infrastructure in a city seems to account for its circularity. As for the contribution of specific components of circularity to a city's smartness, only the Waste Management index positively correlates with the Sustainable Smartness index on both PCA dimensions. This may be due to the critical importance of waste management for a city.

From a managerial point of view, the obtained results suggest a set

of important implications. Firstly, environmental issues should not be neglected during the planning and implementation of smart city initiatives as they are, in fact, closely and positively connected. Indeed, it is not uncommon to highlight this relationship by appealing to a “smart sustainable city” concept. Secondly, although most large European urban centers are ready to implement circular economy and smart city initiatives, only a minority of them scored highly on both indices. The others are clustered near the origin of the axes. Upon observing the PCA maps of individual cities, it becomes clear that smartness issues were addressed more frequently than circularity issues. We advise city planners and managers to consider circular economy initiatives more willingly while planning for a city’s smartness. Not only may they produce benefits of their own but, given the positive relationship between circularity and smartness, they would induce an indirect positive effect on the latter through the implementation of the former. Thirdly, the presence of a well-developed ICT infrastructure would undoubtedly benefit the future circular economy initiatives of a city. While planning for both circularity and smartness, city managers should consider the synergetic relationships between the two.

Given that the dataset was not based on a random selection of cities, there is an obvious limitation to our analyses. The conclusions and suggestions above apply to cities of considerable size in the EU, with more than one hundred thousand inhabitants, that are already pursuing smartness and circularity initiatives. The generalization of the results is impossible unless the city in question is similar to a generic large urban center in the European Union.

Regardless of the high face validity of the Sustainable Smartness and Circular Economy indices, more in-depth statistical validation of both is needed. Further replication studies should also be performed to assess the reliability of the indices. The principal component analysis was used to uncover the latent relationship among the indices and describe them inductively. However, to validate the model, a more formal and structured analysis of its components is needed. This may be achieved in future studies by applying a more formal and standardized statistical framework such as structural equation modeling.

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Gender diversity on corporate boards: when the voice is not enough

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Abstract

Purpose of the paper: To understand the “black box” of boardroom behavior, we test the impact of different thresholds of female directors on a set of board processes. Using the two percentages indicated by the gender quota law, we distinguish between two possible situations that women face: (1) voicing of women’s opinions, and (2) having their voices heard.

Methodology: We employ an econometric model to test our research question on a sample of all of the 40 Italian companies listed in the FTSE-MIB between the years 2008 to 2015,

Findings: We provide evidence that when women voice to their opinion (i.e. they are represented by at least 20% of the board seats), boards devote more time to their activities, and the cognitive conflicts among members is enhanced. However, when women’s voice are heard (i.e. when the threshold of at least 33% of women is reached), boards increase the directors’ attentiveness, and women become particularly effective in boosting the cognitive conflicts.

Research limits: In our analysis we use proxies of board behaviour that are built from secondary data.

Practical implications: Our findings provide insights which have implications for gender quota regulation, and offer a new understanding of the contribution of women at decision-making position levels.

Originality of the paper: We further develop the critical mass theory in the context of women on boards, focusing on two different situations that women might face. We analyse the channel variables between women on boards and corporate governance, investigating board behaviour and board dynamics.

Key words: corporate governance; women on boards; gender diversity; board processes; critical mass; gender quota.

1. Introduction

In recent years, a number of countries have started to discuss regulations, policies, and practices to increase the number of women on corporate boards (Casey, Skibnes, and Pringle, 2011; Cook and Glass, 2014; Labelle *et al.*, 2015; Cullen and Murphy, 2018). The promotion of gender diversity is based on the reasoning that women contribute to better corporate governance, and hence, firms’ performance (Wiley and Monllor-Tormos, 2018). A major assumption underlying this relationship is that women bring different resources, qualities, and managerial practices to the

board that potentially enhance its performance. The value that women add and bring to the boardroom remains a puzzle, and the empirical evidence calls for additional verification (Huse *et al.*, 2009; Nielsen and Huse, 2010a, 2010b; Wiley and Monllor-Tormos, 2018).

Prior corporate governance studies represent gender diversity as the following measures: the ratio of women on the board, the presence of women (dummy), and the number of women (Gabaldon *et al.*, 2016; Post and Byron, 2015; Terjesen *et al.*, 2009). The effects of gender diversity on board outcomes are not conclusive. Drawing on the theory of critical mass, we explore when female directors, as the minority, influence the group work in the boardroom and bring pronounced improvement in the engagement of the directors in the board activities. In accordance with emerging literature (Konrad *et al.* 2008; Torchia *et al.* 2011; De Masi, 2021), we argue that female directors are more effective when a critical mass of women on boards is reached. When this critical mass is achieved, women are more likely to give voice to their opinion. However, this may not be enough to influence certain board processes. In our study, we focus on two distinct sets of board process: (1) effort norms, and (2) cognitive conflicts. Effort norms are expressed as (a) the time that board members devote to specific board activities, and (b) the degree of attentiveness and participation of board directors. Cognitive conflicts refer to the presence of multiple viewpoints that create task-content related disagreement among board members.

Given the thresholds imposed by the gender quota law in Italy, our study shows that different critical masses of women impact processes through the improvement of board effort norms, as well as by boosting the board's cognitive conflict. We demonstrate that when women reach the threshold of 20%, boards devote more time to the board activities, and the cognitive conflict is enhanced. Moreover, we provide evidence that the threshold of 33% of women on boards is necessary to have an impact on the degree of attentiveness of the directors, and to further boost the cognitive conflict among members. Our results suggest that the voicing of women's opinions (which is likely to occur when the women reach the threshold of 20% of the board) is required to impact the time that boards employ in their activities. But to impact directors' attentiveness and to enhance the cognitive conflict among members, women's voices should be heard (which is likely to occur when the women reach a threshold of 33% on the board).

The paper contributes to the research literature in three ways. First, we validate the critical mass theory in the context of women on boards; this has attracted limited attention from empirical studies (Joerck *et al.*, 2013; Torchia *et al.*, 2011; Konrad *et al.*, 2008; De Masi *et al.*, 2021a). We show how different thresholds of female directors on boards matter with regard to board activities. The selection of country is crucial for this type of analysis. Italy provides a particularly interesting context, as reaching a critical mass of women is seen as the main political argument in favour of introducing quota regulations on boards (Torchia *et al.*, 2017). Prior to the law, in 2008, the average percentage of women who held a corporate board position was less than 5% (European Commission, 2018). As of 2012, the

law mandated a binding gender quota for the Italian-listed companies and for state-owned enterprises. In the first board term after the enforcement of the law, the board had to have reached the intermediate threshold of 20% of female directors. In the subsequent board term, 33% of the board seats had to be held by women. The law is well enforced (Desana 2017), and there is a wide range of sanctions, such as a warning, a fine, and the dismissal of all board members. In 2015, the percentage of women on boards in Italy was one of the highest in the European Union. Thus, in this setting of a quasi-natural experiment, we test the critical mass theory applied to women on boards. Second, we also contribute to the stream of research on gender diversity and corporate governance. Our study expands on Wiley and Monllor-Tormos (2018) and De Masi *et al.*, (2021a), by focussing on the channel variables between women on boards and corporate governance. Our study is situated in this research stream as we add to the literature about the potential sets of board processes, and investigate board behaviour and dynamics (Machold and Farquhar, 2013; Nielsen and Huse, 2010a, 2010b; Slomka-Golebiowska *et al.*, 2022). Moreover, we contribute to the discussion on how increasing the percentage of women on boards affects board activities.

The rest of the article is organised as follows. In the next section, the theoretical framework of the critical mass of women on boards is reviewed. After formulating the hypotheses, the dataset, the variables, and the methods used are presented. In the subsequent section, the results of our study are discussed. Finally, conclusions and implications for policy makers and regulators are proposed.

2. Theory and Hypothesis

2.1 *A critical mass of women on boards: from voicing the opinions to having the voice heard*

We built our research on the seminal work of Kanter (1977) that pioneered the critical mass theory. In her analysis, she focusses on the challenges faced by a minority, such as women in a male-dominated environment. When women are underrepresented, they may be seen as a symbol; a token. Kanter identifies three behavioural challenges of being a token: visibility, polarisation, and assimilation. First, visibility relates to a situation where the minority group finds itself being constantly watched. They are afraid to make any mistakes that could be perceived as fatal, and thus they tend to work much harder than men to receive recognition. Simultaneously, they are subject to increased performance pressures. Second, polarisation takes place when men may exclude the minority group from informal networks as they feel uncomfortable around women. Thus, men will exaggerate their similarities and emphasise the differences between men and women in order to prevent women from networking. Third, assimilation pressures women to accept the gendered stereotypes defined by men. Therefore, only limited roles and work are assigned to women. This only perpetuates stereotypes, and continues to set women

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apart from the position of men within the group. The contribution of the token to the group can be hindered by stereotyping and categorisation. Individuals tend to categorise others according to easily observed identities such as gender (Carli and Eagly, 2002; Tajfel and Turner, 1986). When no other information is available, people rely on gender stereotypes, which are women's values, attitudes, and behaviour (Bird, 2003). Individuals favour those who are similar to them (Goodreau, Kitts, and Morris, 2009). However, stereotyping and categorisation create isolation, discomfort, and a lack of confidence among members of a minority (Ely, 1994; Heikes, 1992; Kanter, 1977; Simpson, 1997, 2000; Simpson and Lewis 2005). Thus, they hinder the exertion of the minority's influence on the group and on its decision.

Negative stereotyping and social categorisation are even stronger in the upper echelons of the company, due to the need for trust (Stafsdudd, 2006). The board work largely depends on each member; thus, the effect of the critical mass of female directors on group performance is more pronounced in the boardroom than in other contexts. On boards, one may assume actions, values, commitment, and loyalty are based on easily observable demographic characteristics, such as gender. When there is little personal knowledge and no time for communication, board directors rely on shared understating. These challenges that women face may be changed when the numerical representation of women increases. According to the critical mass theory (Kanter, 1977), women will not behave in a tokenistic fashion, when the numerical representation of women in a group is between 20% and 40%. Joecks *et al.* (2013) prove that the critical mass of female directors lies in the range of 20% to 40% of the total board. When women reach a critical mass, they are not treated as tokens, and they can influence the decision-making culture of the board. Gender is no longer a barrier to acceptance and communication. Women are free to raise questions, but they are more likely to be heard once their numerical representation increases (Konrad *et al.*, 2008).

There is a limited number of empirical studies that verify the critical mass theory in the context of women on boards (Konrad *et al.*, 2008; Torchia *et al.* 2011; Joerck *et al.*, 2013; Wiley and Monllor-Tormos, 2018; De Masi *et al.*, 2021b). The first empirical study that identifies the behavioural consequences of being a token minority representative on a board is Konrad *et al.* (2008). The authors document the following behaviour towards tokens: hypervisibility or invisibility, isolation, being stereotyped and viewed as representing all women, and needing to work harder to have an impact on the group. Being the minority on the boards, women choose to be socially invisible, and maintain a low profile within the board. Empirical research shows that powerful men who are sitting on boards tend to connect and socialise with men who are similar to them (Nielsen, 2009; Stafsdudd, 2006). Nielsen and Huse (2010b) confirm that gender stereotypes may limit the potential influence of women on boards working as a group. These authors demonstrate that the perception of women as unequal board members may limit their potential contribution to board decision-making. Being token representatives of their gender, women tend to assume caricatured roles, and are more like symbols on boards rather

than substance. Testing critical mass theory in the board context, and based on primary data from Norwegian boards, Torchia *et al.* (2011) confirm the previous research outcomes. Specifically, they show that in a tokenistic role, female directors are unable to positively impact strategic board tasks and organisational innovation. The empirical evidence confirms the critical mass theory that gender diversity does not matter if women are merely tokens. Focussing on the relationship between board gender diversity and firm performance, Wiley and Monllor-Tormos (2018) suggest that below the critical mass threshold, women may represent a disadvantage to the board, as this situation may facilitate the formation of subgroups, dysfunctional conflicts, and distrust. However, at or above the critical mass threshold, women facilitate the better monitoring of management, greater resource provisions, and divergent thinking. Building on that, we look inside the boardroom, focussing on the relationship between the critical mass of women and board processes.

2.2 Gender diversity and board processes

Drawing from the critical mass theory, we look at the relationship between certain thresholds of women on boards, indicated by the gender quota law, and a set of board processes. We have built on the conceptual framework of Forbes and Milliken (1999) that considers board processes as an intermediate step between board characteristics and board performance. In this section, we discuss two board processes: (1) effort norms and (2) cognitive conflicts.

The first board process captures the effort of individual board members (Steiner, 1972; Wageman, 1995). Hence, effort norms ensure a high level of preparation, participation, and analysis of the board contributing to its activities. There are two important manifestations of the board effort norms: (1) the time that directors devote to their tasks; and (2) the directors' degree of attentiveness to, and participation in, their tasks. The manifestation of effort by female directors may be more pronounced. Previous studies show that the presence of women on boards improves firm monitoring, as they are not perceived as part of the "old boys' network". According to the critical mass theory, women have harder jobs as a minority to establish credibility, and to influence other board members. They are not perceived to be part of the "old boys' network" (Ibarra, 1993; Holgersson, 2020). All these factors can make women more vigilant than men when preparing for board meetings (Singh *et al.*, 2002; Huse and Solberg, 2006). Konrad *et al.* (2008), analysing the impact of the critical mass of female directors on board behaviour, show that women who are part of the minority feel free to raise issues. We expect that the change of women's status in boardrooms from token representatives to fully fledged board members should occur when certain thresholds of female directors are reached. Hence, we hypothesise as follows:

Hypothesis 1: At the threshold of 20% of female directors, women voice their opinion, thus improving the board effort norms expressed as the time devoted to their tasks.

The degree of attentiveness and participation in board meetings refers to the careful scrutiny of information provided by management before meetings, finding information regarding issues that are relevant to the company, and actively participating during meetings. Compared to men, women experience more difficulty establishing credibility and influencing others. This means that they tend to put more effort into preparing and participating in board meetings (Carli, 1999; Foschi, 2000; Singh *et al.*, 2002). Izraeli (2000) and Huse and Solberg (2006) argue that women prepare conscientiously for board meetings. Thus, women directors frequently ask questions, so they tend not to quickly accept information circulated by executives. Women are likely to question business practices that are unethical (Franke, *et al.*, 1997), and tend to apply stricter ethical standards (Pan and Sparks, 2012). While women are likely to voice their opinion when they reach a critical mass, they may encounter difficulties in being heard (Belenky *et al.*, 1997; West and Zimmerman, 2002). We argue that the numerical representation of the minority shifts the board behaviour: the board members accept women and perceive them as equal colleagues. Thus, we hypothesise as follows:

Hypothesis 2a: At the threshold of 20% of female directors, women voice their opinions, and the board members' attentiveness is improved.

Hypothesis 2b: At the threshold of 33% of female directors, women's voices are heard, and the board members' attentiveness is improved.

The second board process is cognitive conflict. This refers to the presence of task-content related disagreement among board members (Jehn, 1995). Hambrick *et al.* (2008) and Huse and Gabrielsson (2019) define boards as interdependent groups which may face difficulties with their interactions and capacity to work as a team. The board effectiveness as a group depends on the utilisation of the knowledge, skills, and multiple viewpoints available on the board. Gabrielsson *et al.* (2007) argue that individual board members do not possess all of the relevant knowledge and information needed on the board. Using the collective knowledge, tapped from each individual that is assembled on the board, determines the effectiveness of the board as a group. Therefore, working as a group has a higher impact on the outcome than the efforts of individual board members.

Female directors bring diversity in terms of knowledge and skills (Ross-Smith and Huppatz, 2010). Studies demonstrate that female directors are differentiated from male board members in terms of education; for instance, they more frequently hold MBA and PhD degrees and have professional experience (Hillman *et al.*, 2002). Studies also show that they are more likely than men to have held managerial positions in areas related to human resources, corporate social responsibility, marketing, and advertising (Zelechowski and Bilimoria, 2004). Furthermore, women have had more international experiences, but they are less likely to have been a CEO or COO (Terjesen *et al.* 2009).

As women bring different perspectives and experiences compared to male directors, they may stimulate discussions and engage in debates

(Pearce and Zahra, 1991; Burke, 1997). Thus, they positively affect cognitive conflict (Torchia *et al.*, 2017). However, a group that is too diverse may result in interactions based on formal communication and bureaucratic procedures (Milliken and Martins, 1996). Thus, decisions are made at a slower pace. Homogenous groups use the same language; hence, consensus is reached faster.

On the one hand, Bart and McQueen (2013) and Adams and Funk (2012) indicate that female board members are more likely to use cooperative decision-making and value interdependence and tolerance. Additionally, women are more empathetic than men, and thus are more likely to accept others' standpoints (Eagly and Johannesen-Schmidt, 2001). Thus, women demonstrate different work styles (Daily and Dalton, 2003) and create a good working atmosphere in the boardroom, while standing up for different values than male directors (Huse and Solberg, 2006).

On the other hand, women are more likely to question conventional thinking (Huse and Solberg, 2006; Bilimoria and Wheeler, 2000). This initiates debates and cognitive conflicts that facilitate the exchange of information among board members (Amason and Sapienza, 1997). The nature of the interactions between board members depends on the size of the minority within the group, for example, female directors. Based on the above arguments, we posit the following hypotheses:

Hypothesis 3a: At the threshold of 20% of female directors on the board, women voice their opinions, and they improve the cognitive conflicts.

Hypothesis 3b: At the threshold of 33% of female directors on the board, women's voices are heard, and they become particularly effective in boosting cognitive conflicts

3. Method

3.1 Sample and data

Our sample consists of 40 Italian companies listed in the FTSE MIB index, and includes observations from 2008 to 2015. The choice of the sample and the research period are in line with the aim of the study to examine the effect of different thresholds of female directors on a certain set of board processes. Italy introduced a law in 2012 on the quota of female board directors required for public companies and state-owned companies. Specifically, in 2012, every listed company had to comply with the regulation, and reach the intermediate threshold of 20% of female directors on the board for the first post-law board term, and then 33% for subsequent board terms. As the thresholds are enforced by the quota law, it is considered to be an exogenous shock to understand the effect of the critical mass of female directors on board processes.

To test out the hypotheses, we used data from Thomson Reuters-Datastream ASSET4 ESG database. This database provides detailed information on some board processes, such as certain corporate governance policies for guiding the behaviour of board members, descriptions of board routines, and the time dedicated to board activities. The original

data sources are the companies' annual reports on corporate governance, financial statements, and any other publicly available documents that were related to the companies' corporate governance. Measures of board processes are based on scores calculated by equally weighting and z-scoring all underlying data points, and comparing them against all of the companies in the ASSET4 ESG database. A higher score indicates a better board process and a better performed board task. Because of the availability of data in the Thomson Reuters-Datastream ASSET4 ESG database, the final sample consisted of 35 companies. We also eliminated three companies from this sample which did not disclose data about board attendance and meetings.

3.2 Variables

The dependent variables are related to the board processes discussed in the theory and the hypotheses development sections. Based on the research (Forbes and Milliken 1999; Huse 2005, 2007; van Ees *et al.*, 2009), we distinguish a set of board processes: (1) the effort norms related to the time that the board member devote to their activities; (2) the effort norms expressed as the board members' attentiveness and participation; and (3) the cognitive conflict.

The first board process is proxied by board attendance and board meetings. These capture the time that directors devote to board activities. These two proxies also measure the flow of information between board members. The more intense the flow, the better the understanding of company activities. Thus, board members are more prepared for the decision-making process.

Being present and well prepared for board meetings is necessary, but not sufficient, to becoming involved in board activities, and participating in boardroom discussions. Thus, we introduce the second board process as the effort expressed as the board members' attentiveness. This includes a set of norms and codified rules that guide board members' behaviour (Van Ees *et al.* 2009; Nielsen and Huse, 2010b). These codified rules are policies related to different areas of board activities, board induction programmes, systematic board evaluations and board work instructions. This board process is proxied by a Datastream score assessing whether the board has internal information tools to develop appropriate and effective board member behaviour.

The third board process is cognitive conflicts. Diversity is supposed to influence discussions among board members because it brings into the boardroom different knowledge, backgrounds, and perspectives (van Knippenberg and Schippers, 2007; Fisher *et al.*, 2012; van Dijk *et al.*, 2017; Bell *et al.*, 2011). We proxy the level of cognitive conflicts in the boardroom by the presence of a well-balanced board composition in terms of experience, knowledge, skills, and qualities. We use a Datastream score assessing whether the company has rules to maintain a well-balanced board.

These two scores are Z-scores, which range from zero to 100. They express the value in units of standard deviation of that value from the

mean value of all companies. They are calculated by subtracting the mean value of all the companies from the score of the single company, and then dividing this difference by the standard deviation of all companies. They are relative measures which compare one company with a given benchmark. They enable the creation of more distinction between values that otherwise might be very close together.

We use two dummy variables that indicate the two thresholds of women on the board introduced by the gender quota law: 20% and 33%. The coefficient of the dummy variables measures, respectively, the effect of women's opinions and the effect of having women's voices heard on board processes.

We include control variables related to the board characteristics that affect board processes; size, and independence have been considered two of the most important variables in explaining board activities (Dalton *et al.*, 1998). The former is measured as the total number of directors sitting on the board. The latter is measured as the percentage of independent directors on the board. The busy directors' variable is measured as the average number of other corporate affiliations of the board member, and the CEO duality is a dummy variable that is equal to 1 if the CEO is also the chairman. As a proxy of firm size, we use Total Assets. All variables are defined in Table 1. Table 2 reports the descriptive statistics.

Tab. 1: Description of variables

Variable	Description
Time devoted by the board member to board activities	The average number of attendances of the individual board members at board meetings (score)
	Number of board meetings per year (score).
Attentiveness and participation	Z-score assessing whether the company has the necessary internal improvement and information tools to develop appropriate and effective board functions and committees?
Cognitive conflict	Z-score assessing whether the company has rules to maintain a well-balanced board in terms of experience, knowledge, skills, and qualities.
Women 20%	This is a dummy equal to 1 if the percentage of women on the board is equal or greater than 20% and zero otherwise.
Women 33%	This is a dummy equal to 1 if the percentage of women in the board is equal or greater than 33% and zero otherwise.
Independent directors %	Percentage of independent board members as reported by the company.
CEO duality	This is a dummy equal to 1 if the CEO is also chairman, and zero otherwise
Busy directors	The average number of other corporate affiliations for each board member.
Board size	The total number of board members at the end of the fiscal year.

The Scores are calculated by equally weighting and z-scoring all underlying data points and comparing them against all companies in Datastream. The resulting percentage is therefore a relative measure of performance, z-scored and normalised to better distinguish values and position the score between 0 and 100%. A z-score, or "standard score" expresses the value in units of standard deviation of that value from the mean value of all companies.

Source: Own development

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Tab. 2: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Time devoted by the board member to board activities (Board Meetings Score)	225	57.12	26.55	1	100
Time devoted by the board member to board activities (Board Attendance Score)	256	41.20	29.82	0	95.90
Attentiveness and participation	256	64.34	26.36	5.47	81.89
Cognitive conflict	256	61.25	2.79	54.51	63.65
Female directors %	256	13.48	11.75	0	50
Independent directors %	238	55.09	22.58	0	100
Board Size	256	15.77	5.77	8	38
Busy directors score	250	54.51	29.27	0	90.71
Firm size (total assets)	307	9.45*10 ⁰⁷	1.81*10 ⁰⁸	63404	1.04*10 ⁰⁹

For the definition of the variables, see Table 1.

Source: Own development

2.3 Method of analysis

To investigate the effect of the critical mass of female directors on board processes, we estimate the multiple regression analysis using two distinct sets of board processes. The two thresholds of the critical mass of female directors identified by the gender quota law - 20% and 33% - are regressed on: (1) the effort norms expressed as (a) the time that the board member devote to board activities, and (b) the degree of attentiveness and participation of the directors; and (2) the cognitive conflicts expressed as the presence of multiple viewpoints that create task-content related disagreement among board members. We use fixed effect estimations to control for industry effects. Results are clustered for the firms.

Table 2 presents descriptive statistics. The mean value of the scores for the variables representing the time devoted to board activities is respectively 57.12 (the Board Meeting Score) and 41.20 (the Board Attendance Score). The average value of the variable "attentiveness" is 64.34. The score that proxies the cognitive conflict is 61.25. All these three measures are valued by scores that go from 0 to 100 (Datastream, 2017). A high score indicates a high level of a board's engagement in its activities.

Regarding the control variables, the average board size is about 15.77 members, and the board independence is over 55%, showing that in most of the largest listed companies, the majority of the directors is independent. CEO duality occurs in 19% of companies.

The average representation of women on boards in our sample is 13%. The period investigated includes 2012, the year the gender quota law was introduced. The introduction of this new requirement about the gender balance in the boardroom has changed the board composition, increasing the proportion of women on boards. For this reason, we also provide descriptive statistics by year (Table 3). In 2005, the average percentage of women on boards was 3.25% and in 2017 it was 26.50%. In 2005, 25% of the companies reached the first threshold required by the law (20%

of women on boards) and 22% of the companies achieved the second threshold of 33%. After the introduction of the board gender quota law, the average percentage of companies that had at least 20% of women on boards increased from 38% in 2012 to 92% in 2015. Whereas the average percentage of companies that had at least 33% of women on board was 23% in 2012 and 38% in 2015.

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Tab. 3: Percentage of women by year (average values)

Variable	Women on Boards %	20%	33%
2008	3.25	0.25	0.22
2009	3.65	0.25	0.22
2010	7.74	0.25	0.20
2011	8.47	0.26	0.20
2012	13.45	0.38	0.23
2013	19.31	0.58	0.30
2014	24.34	0.75	0.38
2015	26.50	0.92	0.38

Source: Own elaboration

4. Results and discussion

The regression results show the different effects of the thresholds of women directors on board processes (Table 4). Specifically, we find that the effort norms (models 1 to 6) measured as the time devoted by directors to the board activities, and the board directors' attentiveness are affected by the threshold of 20% of women. At this threshold, women voice their opinions. When the board has at least 20% of women, board meetings rise by 2.77. The threshold of 20% also has a positive and significant effect on the board attendance (score). When the percentage of women on boards is at least 20%, the board attendance score increases by 3.64. Board meetings and board attendance are fundamental sources of internal firm information for directors. Hence, the higher these numbers, the more relevant the information the board members can acquire, and the higher the quality of decision making by boards. According to Huse and Solberg (2006), boards with higher female representation are also more likely to engage in constant professionalisation on the job by organising extra meetings, such as orientation programmes or deep dives. Our results document that the difference in the board member's behaviours in terms of time devoted to the board activities is visible at the threshold of 20%. Giving a voice to women makes the whole board more engaged in its activities. At the threshold of 33%, board members do not change their behaviour. Thus, at the threshold of 33% of women, boards may just continue with this new attitude. Our results suggest elevating women's voices influences an increase of the directors' time spent on board activities. In particular, women voicing their opinions is sufficient to increase the attendance of board members, thus pushing them to participate in the board meetings.

Tab. 4: Results

	Effort norms						Cognitive conflict	
	Time devoted by the directors to board activities				Attentiveness of the directors to the board activities			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Women (20%)	2.77**		3.64*		4.46*		0.87***	
	(2.19)		(1.82)		(1.79)		(3.28)	
Women (33%)		1.09		2.99		10.70*		0.78***
		(0.52)		(0.41)		(1.83)		(4.72)
CEO duality	2.23*	1.32	3.26	2.20	-14.83***	-15.16**	1.05***	0.93**
	(1.88)	(1.24)	(0.89)	(0.62)	(-3.22)	(-2.26)	(2.74)	(2.24)
Independent directors %	0.02	0.02	0.10*	0.12	0.06	0.08	0.01	0.01
	(1.02)	(1.18)	(1.87)	(0.06)	(0.89)	(0.60)	(0.58)	(0.82)
Busy directors	0.03	0.03						
	(1.26)	(1.58)						
Board size	-0.29*	-0.35**	0.15	0.05	0.79*	0.73**	0.07***	0.05***
	(-1.95)	(-2.09)	(0.37)	(0.92)	(1.72)	(1.92)	(2.77)	(2.12)
Total assets	1.36*10 ⁹	1.93*10 ⁹	-2.04*10 ¹⁰	-6.62*10 ¹⁰	4.16*10 ^{8**}	4.00*10 ^{8**}	3.74*10 ¹¹	4.71*10 ¹¹
	(0.38)	(0.59)	(-0.01)	(0.96)	(1.95)	(2.72)	(0.97)	(0.96)
R-squared	0.26	0.28	0.60	0.61	0.20	0.25	0.17	0.21
N. Obs	188	188	212	212	238	238	238	238
N. Firms	29	29	32	32	35	35	35	35

T-statistics are reported in brackets. *, **, and *** denote significance at 10%, 5%, and 1% respectively. Robust standard errors are clustered at the firm-division level. Results are controlled for industry. All tests are two-tailed. *Time devoted by the directors to board activities* are proxied by board meeting score (columns 1 and 2) and board attendance score (columns 3 and 4). *Attentiveness of the directors to the board activities* is a score that measures whether the company has internal tools to develop appropriate and effective board functions and committees. *Cognitive conflict* is a score assessing the company's rule to maintain a well-balanced board in terms of experience, knowledge, skills, and qualities.

Source: Own development

However, devoting time to attend board meetings might not improve its effectiveness if the directors are not active in gathering information and discussing the board agenda. A stream of research argues that directors might not be particularly effective in performing their tasks if they receive limited information, and they do not spend enough time exchanging ideas among themselves or with the management (Vafeas, 1999). Our results document the fact that women on boards also improve the board members' attentiveness. Meeting the threshold of 20% of women on boards significantly and positively affects the attentiveness of the board members. When the percentage of women reaches 20%, the attentiveness score rises by 4.46. This effect more than doubles when the percentage of women is equal to, or higher than, 33%. Our results suggest that boards benefit when women voice their opinions. Gender-diverse boards are more often engaged in board activities, such as a regular board assessment and a review of the balance of board skills, knowledge and experience, as well as CEO succession planning (Singh and Vinnicombe, 2004). Huse and Solberg (2006) state that women directors, being less experienced board members, may devote time to board evaluation, and can identify

areas for improvement. They also indicate that boards with higher female representation are more likely to engage in constant professionalisation, as female directors are devoted to improving their visibility. They are diligent, and they work hard as a board member to avoid having stereotyped women's roles assigned to them within a team of board members. These benefits are particularly present when women's voices are heard, and the board is able to exploit the advantages of better balance. At a threshold of 33% of women on boards, women's voices are heard and accepted by the other board members. At this threshold, women start to be considered as equal colleagues by male directors, and their opinions are taken seriously. Specifically, women's tendency to ask for more codified information through formal channels might also induce other board members to make similar requests, and to support the women's request.

The second board process is cognitive conflict. The thresholds required by the law also have a positive effect on the level of cognitive conflict. A 20% and 33% percentage of women on the board improves the balance of the board by 0.87 and 0.78, respectively. It seems that at the thresholds of 20% and 33%, boards have just the right amount of diversity in terms of skills, experience, and competences, and the level of cognitive conflict increases. Having a voice and being heard improve the cognitive conflict among board's members. Research clearly states that cognitive conflict is influenced by demographic differences among group members, which affects the group interaction (Skvoretz and Fararo, 1996; Webster and Foschi, 1988; Martins and Sohn, 2022) in two possible directions. The first direction, which is the most preferred, is called "kaleidoscope thinking" (Kanter, 1986, p. 11). This means that the diversity of gender, knowledge, skills, and experience might stimulate creative idea production by other members because the board members rearrange and combine information and knowledge to create new ideas or solutions. The second direction is called "group faultlines" (Lau and Murnighan, 1998), which refers to situations in which the gender diversity splits the board into subgroups. These might be in contrast with each other, and raise barriers that make it more difficult to discuss alternative ideas proposed by the opposite subgroup. While most of the studies focus on the behaviours of people in the same subgroups (Chen and Tesluk, 2012), our results indicate that at the threshold of 20% the behaviour of male directors changes. At the threshold of 30% women's voices are heard, accepted, and supported. At these thresholds the gender is not an attribute that creates conflicts among subgroups. The proportions of women and men become more balanced, and the diversity of knowledge, skills, and experience are more likely to be used in board discussions.

Regarding the control variables, CEO duality has a positive and significant effect on the time that board members devote to the board activities, which is measured as the board meetings score, but it has a negative and statistically significant effect on the presence of internal tools used to acquire information. This is in line with the argument that CEO duality can be seen as a measure of CEO power within the board. If the CEO is also the chairman, the company might require more board meetings to formally show commitment towards the monitoring of CEO activities.

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However, because of the CEO's power on the board, board members might feel uncomfortable in introducing and putting in place formal tools to acquire more information.

The board size has a negative and statistically significant effect on the Board Meetings Score, but it has a positive and statistically significant relationship with Board Attentiveness, measured as the score assessing whether the board has formal information tools in place. These results are in line with the previous studies which suggest that a larger board might not be particularly effective in monitoring because of possible problems of groupthink and social loaf (Thompson, 2008). As the board monitoring is often measured as the number of board meetings (Vafeas, 1999), this explains the negative relationship between board size and board meetings. Larger boards might be affected by lack of commitment, moral hazard problems, and greater control by the CEO (Faleye *et al.*, 2011). For these reasons larger boards might require more formal tools to gather information needed to make decisions. On the other hands, large boards have a larger pool of competences, background, and experience. This statement is empirically supported by our results that document a positive relationship between board size and a well-balanced board composition in terms of experience, knowledge, skills, and qualities.

5. Conclusion

In recent debates on gender equality, there is a growing emphasis on the benefits of increasing the number of women on corporate boards. Our study moves the discussion forward, focussing on the relationship between different thresholds of a critical mass of women on boards and boards activities, concentrating on two statuses of women: women voicing their opinions, and having their voices heard. Building on the critical mass theory, this article contributes both to theory and practice by studying the effect of the two measures of the critical mass of female directors introduced by the gender quota law on board processes.

The major novelty of the research is to provide evidence that different thresholds of critical mass causes different effects on board outcomes depending on the type of board process. Our findings show that boards that reach the threshold of 20% of female directors identified by the quota, devote more time to board activities. Boards that reach the threshold of 33% of female directors have higher attentiveness. The threshold of 20% makes women more likely to ask for additional information and to raise their voices. This propels the board members towards greater diligence and stronger engagement in board activities. At the threshold of 33%, women are perceived as equal colleagues, and the board becomes more attentive to its activities.

We also document the fact that when women voice their opinion (reaching 20% of the board seats) and their voice is heard (reaching the threshold of 33%), they improve the level of cognitive conflict in the boardroom, setting the scene for better board decision-making processes. One explanation could be that when the critical mass reaches 20%, the

minority feel more comfortable in raising their voice. When the minority reaches the threshold of 33%, it is accepted by the majority in the group. This means that women's different knowledge and perspectives are more likely to be utilised.

The paper makes several contributions to the academic and professional debate on women on boards. First, we test the validity of critical mass in the context of women on boards. Our result moves the debate about gender diversity in the boardroom from the ratio/presence of female directors to critical mass and the difference between giving voice to opinions and having the voice heard.

Second, in contrast to previous research, we demonstrate that certain board processes may require different dynamics from the board as a working group, and thus, raising the threshold of the critical mass of female directors brings different effects.

Third, our study contributes to corporate governance research by offering a new understanding of how gender diversity influences corporate governance. We explore what is happening in the "black box" of the boardroom. The focus on board processes provides a better understanding of how boards operate, and how a critical mass of women affects board activities. Our study fits in with the trend of research that attempts to open "the black box of board behaviour" (Machold and Farquar, 2013, Zattoni *et al.*, 2015; Zona and Zattoni, 2007; Brown and Kelan, 2020).

Fourth, this study has important implications for corporate boards and policy makers. In preparation for implementing the Directive of the European Parliament and of the Council on improving the gender balance on boards of companies listed on stock exchanges, several governments across Europe have adopted quotas to increase gender diversity on corporate boards, including Italy. The requirements for a critical mass of female directors on corporate boards of Italian companies will not be mandatory after 2030. Our research demonstrates that different thresholds of the critical mass of women on boards have improved a certain set of board processes. Moreover, we advocate quota regulation as an effective and the only enforceable affirmative measure of reaching a critical mass of female directors. Reaching a critical mass of women brings added value to the boardroom. This is a way to show male leaders that essential gender beliefs are a myth. Changing these underlying beliefs is crucial to motivate men to become change agents for gender equality. It may be especially crucial in countries that traditionally have very low institutional support for women in their careers, unlike in the Nordic countries - predominately Norway - which most research has referred to.

We also acknowledge some limitations of the study and directions for future research. First, research demonstrating how women contribute to better decision-making processes is unexplored. Understanding which board decisions are impacted by the changes to decision-making processes enforced by the women's presence on boards is the key to understanding the contributions made by gender diversity. More qualitative studies are needed to reveal the extent to which decisions change when more women were nominated to the board.

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Second, we do not test the interrelation between different board processes. More research is needed on the relationship between the critical mass of women and board processes, as it may be critical to understand the value added when women are on boards.

Third, the cognitive conflict and effort norms are very complex phenomena. We approach these topics, focusing on one single aspect which is the presence of women on boards. Although in our models we control for a set of control variables, the cognitive conflict and the attentiveness of the directors during the board meetings might be correlated with the complexity of the business environment or/and the complexity of the relationships among board members. In this vein, women on boards might be seen as a moderator of the relationship between the board processes (i.e. the cognitive conflict and effort norms) and the complexity of the decisions that the board is asked to make. Future research might go into this direction.

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The impact of entrepreneurial team experience on the speed of new venture internationalization

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Abstract

Frame of the research: The international experience and orientation of the entrepreneur are one of the dominant explanations for early and accelerated new venture internationalization. We put this explanation to test by investigating the impact of multiple, nuanced dimensions of prior experience on the speed of reaching significant international sales and by extending the view from the individual to that of the team.

Purpose of the paper: International entrepreneurship studies have predominantly focused on the individual's role in international expansion, neglecting the overall team experience and knowledge. This study relates a variety of experience dimensions that characterize the team to the speed of reaching significant foreign sales.

Methodology: Upper Echelon theory is transferred to the context of the new, small firm and used to theorize the impact of entrepreneurial team experience on the venture's speed to reaching significant export intensity. Special attention is paid to the many facets of experiential knowledge. An OLS regression is employed on a set of 98 Italian and German new ventures.

Results: Results of the OLS regression confirm the importance of the teams' industry experience, while, surprisingly, international experience exerts a significant but negative effect on the speed required to reach significant foreign sales. Experience in import-export related functions and gained in MNEs, as well as foreign language competence, do not show significant impact.

Research limitations: The limited sample size does not allow to single out all experience variables.

Practical implications: Practitioners and entrepreneurs who pursue fast international expansion get insight into the 'ideal' composition of the team.

Originality of the paper: To the best of our knowledge, this paper is the first to empirically analyze the impact of the many dimensions of prior team experience on the speed of internationalization..

Key words: Internationalization; Upper-Echelon-Theory; entrepreneurial team; international experience; born global; international new venture

1. Introduction

Entrepreneurial teams have received relatively little attention in International Entrepreneurship (IE) research (e.g. Loane *et al.*, 2007). In view of the fact that the majority of new ventures are team-founded this is surprising (e.g. Bordet, 2019; Bormans *et al.*, 2020; Denicolai *et al.*,

2015). It is even more surprising because the founders of new ventures are considered the key resources of the young and small business (e.g. Wright *et al.*, 2007).

Given the new ventures' overall resource scarcity, the resources that entrepreneurs bring to their firm - their mindset, experiences and knowledge - have been considered especially valuable. In the entrepreneurial internationalization stream of IE, experiential knowledge acquired prior to foundation has been described as one of the key drivers and explanations of their early, fast, and intense internationalization (e.g. Rialp *et al.*, 2005; Zucchella *et al.*, 2007; Coviello, 2017; Hennart *et al.*, 2021).

For example, with prior international experience entrepreneurs possess readily available experiential knowledge which is important for discounting risk and for aiding leapfrog stages related to internationalization - making them enter foreign markets more quickly and realize more significant sales. However, if cohorts of entrepreneurial internationalizers are compared with their more traditional or later internationalizing counterparts, findings as to the role of the various experience dimensions, e.g. from work or education, industry or functions, are mixed or limited (Hennart *et al.*, 2021).

Thus, what is missing in extant research is not only the focus on entrepreneurial teams vis-à-vis the individual entrepreneur, also the multifaceted nature of 'experience' needs additional investigation.

To shed more light on this topic, our study aims to answer the following research question: "Which *dimensions of prior team experience* affect the new venture's speed to reaching significant foreign sales?" The paper draws on the Upper Echelon Theory (UET) as the theoretical background for the study. UET, as we argue, is appropriately transferable from the Top Management Team background to the new venture setting. OLS regression is employed on a sample of 98 German and Italian new ventures.

We contribute to a fine-grained understanding of experience dimensions, which helps bring together a foundational assumption of IB theory (i.e. the Uppsala internationalization process model) and IE explanations. Importantly, we extend the view from individual experience to team experience to determine its role on the speed and intensity of new venture internationalization to contribute to the IE discussion on the importance of internal drivers of entrepreneurial internationalization. Relatedly, we show that the premises of the UET hold in a small firm context.

The remainder of the paper is organized as follows. We firstly introduce the Upper Echelon Theory (UET), and discuss its transferability to the new venture context. We then proceed with a literature review and hypothesis development and follow up with the empirical analysis details data collection, measures, method and findings.

A discussion and conclusion section terminates the work.

2. Theoretical background

2.1 The Upper Echelon Theory (UET)

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speed of new venture
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Our approach follows the UET, i.e. the view that an organization is the reflection of its top managers (Hambrick and Mason, 1984), which is based on the premise of limited rationality (Cyert and March, 1963). According to UET assumptions, especially when it comes to strategically important and complex decisions - of which internationalization is an example - top managers do not proceed objectively, but rather include subjective experiences, values, and external influences in their decision-making (Hambrick and Mason, 1984). Each decision-maker thus brings their individual resources to make “strategic” (Hambrick and Mason, 1984) decisions and solve complex situations. These individual resources include the cognitive characteristics - experience-based knowledge of future events, alternatives, and relevant consequences - of each decision-maker (March and Simon, 1958).

The UET has been developed for and proved to be useful mainly in the context of Top Management Teams, and thus longer established and larger firms. Therefore, the extent of transferability of the model towards international new ventures (INV) must be determined.

First, in line with Jin *et al.* (2017), it may be argued that in the small young venture context the reflection of the managerial characteristics on strategic decisions and performance of the company will be much clearer.

Second, the UETs conditions of limited rationality are most likely to occur in the presence of, for example, high job demand (Hambrick *et al.*, 2005).

Job demand is influenced by task challenge which is described as “the conditions that make it difficult for an executive to attain a given level of performance” (Hambrick *et al.*, 2005: 476). Hambrick, *et al.* (2005) argue that this level of difficulty depends on both the external environment and the internal resources and capabilities of the organization. Since the new venture environment and especially the INV environment is described as being complex and dynamic (Amason *et al.*, 2006; Schjoedt and Kraus, 2009; Hagen *et al.*, 2019), the task challenge is high, leading to a higher job demand. From the internal perspective, new ventures have to cope with the liability of smallness and newness (Stinchcombe, 1965) which is exacerbated in the INV by the liability of foreignness (Hymer, 1976). Therefore, the limited resources of the INV must be used systematically (Shan *et al.*, 2014), which can lead to a higher task challenge and, again, to a higher job demand (Hambrick *et al.*, 2005, p. 476). Founders of INVs also enjoy a high ‘latitude of action’ (Hambrick, 2007) due to their innovative, differentiated offerings (e.g. Knight and Cavusgil, 2004), a dominant global niche approach which guarantees freedom from competition and market power in their niches (e.g. Hennart *et al.*, 2021; Zucchella *et al.*, 2016, Hagen and Zucchella, 2014; Hagen *et al.*, 2012; Hagen *et al.*, 2017) and the absence of internal pressures (due to, e.g. age, size and deeply rooted culture).

Carpenter *et al.*, (2004) develop a new UE approach which integrates additional characteristics, like international experience and team size. The

extension of the model also describes contextual factors, for example the market in which the organization is active. Their work further supports the idea that it is advantageous to look at the team as a whole since tasks and functions are shared within it, considering that the team also proxies the total amount of (cognitive) resources.

Following the above argumentation, the UET can be transferred to our new venture context - it may even provide a better prognosis for entrepreneurial teams than for TMTs.

2.2 Literature review and development of hypotheses

Having established its 'transferability', we follow the UET and extend the dominant IE view that the entrepreneur's (international) experience constitutes a crucial resource for accelerated international expansion to include the team and a more-dimensional view of experience. We thus emphasize the impact of combined entrepreneurs' cognitive characteristics, i.e. various dimensions of experience, on the international performance of the venture. In our context, venture performance is defined as the speed of reaching 25 percent of foreign sales over total sales (Hennart *et al.*, 2021).

To the best of our knowledge, the influence of such fine-grained, *multiple experiences* held by *entrepreneurial teams* on the speed of international expansion has not yet been investigated. Also the type, the direction, and the strengths of these influences remain to be clarified.

The many facets of prior experience and their impact on the speed of international expansion

Entrepreneurs and managers hold objective and experiential knowledge. Experiential knowledge is gained through personal experience. For example, the crucial role of experiential knowledge is reflected in the Uppsala process model (Johanson and Vahlne, 1977). Once acquired, the manager's experiential knowledge has a direct effect on their strategic decisions regarding further international expansion (e.g. which market to enter, to move upwards the establishment chain etc).

Similarly, Shane (2000) emphasizes the importance of experiential knowledge of entrepreneurs to recognize opportunities and the decisions to be taken regarding their exploitation. Experiential knowledge is important for learning from errors, helping to evaluate alternatives, and, more in general, with making the 'right' strategic decisions (Blomstermo *et al.*, 2004). Along these lines, prior international knowledge of founders enables the new venture to leapfrog phases and speed entry into foreign markets.

Eriksson *et al.* (1997) argue that firms initially need to develop knowledge regarding daily business, which then will be changed due to international engagement. Knowledge here refers to customers, competitors but also distributors in a market and can even include the political situation or the culture of the market. According to Reagans *et al.* (2005), daily business can be established much faster when prior industry experience exists and, therefore also this kind of knowledge can foster the internationalization process.

If experience and ensuing knowledge is analyzed through the lens of the resource-based view, the association between knowledge and new venture performance or internationalization can be shown. The experiential knowledge of the entrepreneurs determines the level of human and social capital, i.e. differential resources and capabilities, and shows a significant impact on competitiveness and the performance of new ventures (Kogut and Zander, 1992; West and Noel, 2009).

As the discussion above shows, the origin and the nature of experiential knowledge is multifaceted which calls for a nuanced measurement of experience. Studying the earliest phases of the business, it is *prior* experiential knowledge which needs to be taken into account (e.g. Coviello, 2005). In general, entrepreneurs who can rely on prior experience better identify, assess and take advantage of opportunities, which other entrepreneurs may not take notice of. Similarly, extant research correlated entrepreneurs with high levels of prior industry experience with INV patterns (e.g. Oviatt and McDougall, 1994; Oviatt and McDougall, 2005; Servais *et al.*, 2007; Luostarinen and Gabrielsson 2006); Westhead *et al.*, 2001.

Based on these arguments the following hypothesis is formulated:

H1: Aggregated prior work experience, in the same industry, of the entrepreneurial team has a positive influence on the internationalization speed of the new venture.

Hambrick and Mason (1984) described the functional track as one determinant of managerial characteristics. What is of interest in our context is called the “output function” and describes activities like marketing, sales, and R&D. Hambrick and Mason (1984: 199) state that “There will be a positive association between the degree of output-function experience of top managers and the extent to which the firm emphasizes outputs in its strategy”. According to their hypothesis, one can argue that an exporting function or experience within a company, that operates multi-nationally, can be emphasized in the strategic decisions of entrepreneurs. Moreover, Blomstermo *et al.* (2004) state that experiential knowledge can help managers in their strategic choices regarding foreign market selection and market entry. Since knowledge relates to similar experiences in the past, it can be assumed that an import/export-related function or experience in a multinational company can influence the entrepreneurs’ knowledge regarding internationalization. In their study of new ventures, Reuber and Fischer (1997) found evidence of the influence of entrepreneurs’ prior experience in sales and the internationalization of the new venture. In both ways entrepreneurs gained experience in coping with foreign markets and, thus, this experience helped them with their strategic decision-making process. Prior experience within a multinational firm or in import/export-related functions was found to be correlated significantly with the internationalization process of new ventures (Zucchella *et al.*, 2007; Reuber and Fischer, 1997).

Based on these findings, H2 is proposed as follows:

H2: Aggregated prior experience of the entrepreneurial team within a) a multinational company or b) an exporting function has a positive influence on the internationalization speed of the new venture.

The better opportunity exploration and exploitation of entrepreneurs, through prior knowledge, can also be linked to their international orientation.

Shaw and Darroch's (2004) study of entrepreneurial new ventures in New Zealand showed that the most crucial barrier to internationalization is related to the lack of knowledge regarding opportunities (together with finance). Domurath and Patzelt (2019) among others argue that entrepreneurs with less international experience need more time to identify and seize opportunities in foreign markets. They also argue that an international opportunity similar to one in the domestic market is not necessarily recognized if the entrepreneur lacks international experience. On the flip side, much extant work argues that having prior international experience, on behalf of the entrepreneur, impacts positively on the internationalization process of the new venture (e.g. Gruenhagen *et al.*, 2019; Reuber and Fischer, 1997; McDougall *et al.*, 2003; Baum *et al.*, 2015; Manolova *et al.*, 2002). International experience can be gained by working, living, or studying abroad (e.g. Clark *et al.*, 2018; McDougall *et al.*, 2003). Prior international experience helps managers cope with the uncertainty of the foreign markets and helps them recognize, assess and exploit opportunities better and thus accelerates the internationalization process (e.g. Autio *et al.*, 2000; Baum *et al.*, 2015; Reuber and Fischer, 1997; McDougall *et al.*, 2003; Manolova *et al.*, 2002). According to Hambrick and Mason (1984), the experience of a manager is reflected in their strategies, which means that the international experience leads to an international approach and thus to a faster internationalization of the new venture.

Since entrepreneurs cannot rely on experience within the newly founded venture, they have to rely on similar experiences from their past. The effect of prior international experience can be compared to the effect of prior working experience in a similar field or a multinational company.

Put together, the above discussion leads to:

H3: Aggregated international experience within the entrepreneurial team has a positive influence on the internationalization speed of the new venture.

Moreover, an additional dimension of international orientation is the knowledge of foreign languages.

According to Pankaj (2001, p. 138), trade between two countries is increased by 300% if a common language is spoken. Regarding exports or new venture internationalization, this approach, together with the dimension of 'language distance' (Ghemawat, 2001), can be used to show the importance of language within the entrepreneurial team. Also cultural elements refer to language and speaking a certain language may point to cultural affinity and, thus 'understanding'. Although extant research is mixed with regard to the impact of languages on internationalization speed (e.g. Zucchella *et al.* 2007 find a positive impact while Cannone and

Ughetto 2014 do not confirm significant results), along with our above reasoning we formulate the following hypothesis

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H4: Aggregated knowledge of foreign languages within the entrepreneurial team has a positive influence on the internationalization speed of the new venture.

3. Empirical analysis

Data collection

Data were collected through an online survey in Germany and in Italy in the period from April to June 2019 extracting company emails randomly from AIDA and Crunchbase datasets using as a cut off the year 2000 to avoid retrospective bias. The data that are used in the analysis consist of 98 usable questionnaires which correspond to a response rate of around 13 % and to the first wave of the survey. 75 observations are from Italian and 23 are from German new ventures respectively. A large majority (95 %) of respondents were the founders themselves, the rest being, for example, export managers or other knowledgeable persons (e.g. CFO) in the company having an average company experience of 10,5 years.

The average company age is 15 years. Two thirds of the companies sell consumer goods (of which one third durable consumer goods), the others offer services to consumers and to businesses. Overall, B2C companies constitute 66 % of our sample.

The term ‘company founder’ was defined as “all persons who had entrepreneurial responsibility in the establishment and management of the company, regardless of ownership.” If there was more than one founder, the questions were answered by each founder distinctly. The questionnaire included questions about the number of founders and previous experience as detailed in the measure-section below and the number of languages spoken by each entrepreneur. All variables were measured in terms of the length of experience, i.e. years.

Model specification

We are investigating the relationship between entrepreneurial team characteristics and the speed of reaching an export intensity of 25 percent. Each variable should be considered individually, taking into account the other characteristics of the entrepreneurs in order to avoid distortion of the results. We therefore use an OLS method. The analysis of the model is performed with the freely available statistical software for econometrics, GRETL.

The variables are not normally distributed, nevertheless, this does not indicate that the OLS model cannot be used (Lumley *et al.*, 2002). Lumley *et al* (2002) argue that for the linear regression normality is not required to fit. Next, the linearity of the regression needs to be tested. It can be argued that a structural change at the 76th observation could occur because data

was taken from different countries. Therefore, the linear regression could have a structural change within the model, which can be assessed with the test of equality as proposed by Chow (1960). The output of the test statistics is the following: $F(8,81) = 0,893394$ with a p value of 0,5260. Therefore, the null hypothesis is confirmed, which means that there is no structural break at the observation point of 76 and the regression can be used for the whole dataset. Another check for the model is for omitted variables and collinearity, for which the test for specification errors is used within a least-square linear model (Ramsey, 1969). The test-statistic $F = 2,149967$ with a p value of 0,123 confirms the null hypothesis which indicates that the model is free of the omitted variable bias.

Lumley *et al.* (2002) argue that heteroscedasticity can have an impact on the predictability of the OLS model and therefore must be checked for. The Lagrange-multiplier test from White (1980) is being used and shows that the model is heteroscedastic ($TR^2 = 29,161517$ with a p-value = $P(\text{Chi-square}(33) > 29,161517) = 0,658789$). The heteroscedasticity implies problems with the predictability of the variables and needs to be taken into consideration. To account for the heteroscedasticity in the errors of the variables of the model, the following approach is used: First (I), the OLS estimation of the model is performed. Then (II) an auxiliary regression is executed to generate an estimate of the error variance. Lastly (III), the weighted least squares are analyzed by using the reciprocal of the estimated variance as weight. In the auxiliary regression (II), the logarithm of the squared residuals from the first OLS is regressed. Either the regression takes place on the original regressors and their squares (by default), or just on the original regressors (if the “include squares” box is cleared). The logarithm transformation is made for ensuring the non-negativity of all estimated variances. The weighted series for the final WLS is formed as $1/\exp(u^*)$, under the assumption that the fitted values are u^* (Gretl Statistical Software). This approach is made with the heteroscedasticity-corrected estimates regression, in Gretl.

Measures

Dependent variable

Internationalization speed is defined by the number of months needed to reach an export intensity of 25 percent. It is thus a more fine-grained measure than the one commonly used for reaching this threshold after 3- or 6-years from foundation (Hennart *et al.*, 2021). On average, new ventures achieved 25% of their foreign sales after 33 months, so less than three years.

Independent variables

Prior work experience is measured with the experience in the same or similar industry of the company (in years, before venture foundation) and aggregated for all founders (Jin *et al.*, 2017; Verbeke *et al.*, 2014; Gruenhagen *et al.*, 2018). The measure focuses on the depth of the experience, not the breadth. On average, the entrepreneurial team had approximately 12 years of prior experience in the same industry.

Also prior experience in an MNE or in an export/import related function (Zuchella *et al.*, 2007) is measured in years and aggregated. Since the dataset is small, too many regressors can cause an invalid outcome of the model. Therefore, the two variables were summated. Again, the variable is based on the depth of the experience of the entrepreneur and not the breadth, since the number of years are accounted for and not the different positions within their prior experiences (Gruenhagen *et al.*, 2018). On average, the entrepreneurial team has aggregated experiences in a multinational company or in an export/import position of approximately 7 years.

Also international experience refers to the whole entrepreneurial team and is aggregated, with the distinction between education and work experience (Gruenhagen *et al.*, 2018; Jin *et al.*, 2017; Zucchella *et al.*, 2007). Again, the depth of the international experience is considered and not the breadth. The average international experience is approximately 6 years.

Foreign languages are aggregated and measured with the number of languages spoken by the entrepreneurs. The average entrepreneurial team speaks 3 foreign languages.

We *control* for team size (number of founders) and B2B/B2C status of the new ventures.

The model is checked for multicollinearity with the Belsley *et al.* (1980) collinearity test. The model that was initially intended to be used contained the dummy variable 'Country' which caused a collinearity problem and thus was eliminated from the model. Subsequently the model shows no collinearity and thus is reliable.

In addition, the model has been tested for covariance amongst the variables and endogeneity of the error term and the variables. The covariance matrix does not highlight any clear interdependence of variables. Next, endogeneity was tested. Since endogeneity is determined by a correlation of the model variables and the error, it can lead to an inconsistent model and an inadequate prediction of the outcome (Petrin and Train, 2010). For endogeneity testing, the Hausman specification test is used. The test uses the dummy variable 'country', as part of the error term, since it can have an influence on the international experience and other characteristics. The Chi-square (1) = 2,57459 with p-value = 0,108592 shows that endogeneity is not a problem. The results are summarized in the table 2 below:

Tab. 1: Hausman test of endogeneity (Gretl outputs)

Variable	Dummy country	Null hypothesis
International experience	p-value = 0,108592	Failed being rejected → no endogeneity
Prior work experience	p-value = 0,0582724	Failed being rejected → no endogeneity
Foreign Languages	p-value = 0,122113	Failed being rejected → no endogeneity
Prior MNE/Ex-IM experience	p-value = 0,132244	Failed being rejected → no endogeneity

Source: own elaboration

To summarize, the model is free from endogeneity; corrected towards heteroscedasticity and collinearity of one variable; the regression is linear and has no structural change. The regression is not biased towards omitted

variables but is not normally distributed. The regression is statistically significant, and the variables show good predictability as is shown in the following section.

Empirical findings and discussion

The model is significant (p-value 0,001264) confirming the relationship between the independent variables (Foreign Languages, Prior Work Experience, International Experience, Prior 'Company' Experience) and the dependent variable, ie. the speed to reaching 25 percent of export intensity. Nearly 21% of the internationalization speed variance can be explained through the independent variables in the model (r-square 0.209902; adjusted r-square is 0.157806).

Tab. 2: Model 1 - Control variables B2B Dummy & team size - Results of the regression (Gretl outputs)

	Coefficient	Std error	t-value	p-value
const	51,425	17,0897	3,009	0.0034***
TeamSize	-7,37977	7,12787	-1,035	0,3031
B2BDummy	57,4738	38,7369	1,484	0,1412
Res sum of squares	612,5425	Std error reg	2,539255	
R-squared	0,032684	Adj R-squared	0,012320	
F (2,95)	1,604952	P-value (F)	0,206298	
Log-Likelihood	-228,8559	Akaike crit	463,7117	
Schwarz crit	471,466	Hannan-Quinn crit	466,8484	

Source: own elaboration

Tab. 3: Model 2 - Independent Variables - Results of the regression (Gretl output)

	Coefficient	Std error	t-value	p-value
const	44,8232	8,32025	5,387	5,57e-07 ***
TeamSize	-1,47730	4,64407	-0,3181	0,7511
B2BDummy	28,7192	21,8706	1,313	0,1924
ForeignLanguages	-1,64651	1,14058	-1,444	0,1523
PriorWorkIndExperience	-0,190222	~ 0,164304	-1,158	0,2500
InternationalExp~	0,416187	0,122141	3,407	0,0010 ***
PriorCompanyExpe~	-0,595982	0,191042	-3,120	0,0024 ***
R-squared	0,209901	Adj R-squared	0,157806	
F (6,91)	4,029230	P-value (F)	0,001264	
Log-Likelihood	-198,2919	Akaike crit	410,5839	
Schwarz crit	428,6787	Hannan-Quinn crit	417,9028	

Source: own elaboration

As illustrated in table 3, H1 is confirmed. The industry experience of the team impacts the internationalization speed of the new venture. According to the model, the internationalization of a new venture will be approximately

0.1902 months quicker for each year added to the entrepreneurial team's aggregated prior working experience in the same industry.

Prior experience in a multinational company or an import/export function does not have a significant impact on the speed to reach 25 % export intensity (H2 is rejected).

Hypothesis 3 states that the international experience is positively related to the speed of reaching international sales. While the relationship is significant, the sign is in the opposite direction. The coefficient of international experience is positive, meaning that international experience slows the speed to reaching 25 % of export intensity (p-value 0.4162). A one-year increase in international experience will increase the time needed to reach the threshold by approximately 0,4162 months.

Hypothesis 4 is rejected: Knowledge of foreign languages does not positively influence the speed of international expansion.

With regard to the control variables, there is no evidence that team size or the B2B/B2C status significantly impact on the outcome variable and confidence intervals further confirm that the statistically significant variables are good estimators for the influence on internationalization speed (Eckstein, 2014).

The speed to reaching 25 % export intensity was found to be significantly influenced by prior industry experience and the international experience of the entrepreneurs. While prior working experience in the same industry had the hypothesized positive effect on the time required to reach this threshold, international experience, much to our surprise and against most extant work in IE, shows a negative and significant effect on the speed to reach 'BG status'.

Prior industry experience in a similar field can be argued to enhance the entrepreneur's ability to evaluate alternatives and seize opportunities (Blomstermo *et al.*, 2004) and simultaneously build up their daily business quickly (Eriksson *et al.*, 1997; Johanson and Wiedersheim-Paul, 1975). Together with industry experience valuable networks and customer knowledge can also be expected.

Through prior industry experience, entrepreneurs' strategic decisions regarding international opportunities improve, speeding up the time to reach 25 % of foreign sales.

Secondly, we find no support for H2, which assumes a positive relationship between the prior experience in a MNE or an exporting function and the new venture's international speed. A closer look at the data reveals that only a few ventures have such experiences and, therefore, a possible explanation lies in the limited amount of data. Another explanation is that we are dealing with new ventures and that the organizational context is too different to transfer work experience from the large-sized company. Experiential knowledge refers to similar experiences, and the knowledge acquired in MNEs may not be directly transferable.

Another dimension of experience was related to the international working and studying experience of the entrepreneurs. With H3, a positive influence of prior international experience of the entrepreneurs on the internationalization speed of new ventures was proposed. This relationship proved to be significant but with a positive sign, thus going in

the opposite direction. Again, a possible explanation may be found in the variable itself. Due to the limited data, we have combined study and work experience, which, in extant research has shown mixed and contradictory results. Another explanation may be a trade-off between committed entry modes or the selection of 'difficult' markets and the speed of international expansion. Many INV opt for committed entry modes from the very beginning and also their market selection decisions do not necessarily follow 'easy-markets'-first trajectories (e.g. Melen and Nordman, 2009; Zucchella *et al.*, 2018; Hagen *et al.*, 2019) - bold decisions which may come with extensive international experience. Against the background of UET, we may explain the surprising finding with mental shortcuts due to heavy job demand - instead of looking for comprehensive analyses and decision-making, entrepreneurs may fall back not on what they have tried in the past but what may be suboptimal to confront the current setting.

However, the clear effect of the negative relation between international experience and speed is rather surprising and needs to be investigated further.

Foreign languages had no significant impact in our model, consistent with e.g. Cannone and Ughetto (2014). As of today, the use of English as a universal business language may discount the need for more and diverse language skills.

Finally, we have argued that taking the entire entrepreneurial team experience into consideration will further our understanding in regards to the speed of reaching significant foreign sales. Accounting only for one driver, the teams' experience, more than 20 percent of the variability of our dependent variable, can be explained, supporting the view that entrepreneurial teams are key drivers in internationalization endeavors. It is the cognitive characteristics and knowledge, and not team size, which influences the speed of international expansion. What counts is the team composition, or in other words, the composition of its characteristics. In general, engagement and collective interaction, i.e. behavioral integration (Hambrick, 2007) in the entrepreneurial team should be quasi automatic.

4. Conclusion, limitations, and future research

As is the case with all studies, and our work is no exception as it comes with limitations that present avenues for future research. First of all, the model focuses on the in-depth knowledge and experience of the entrepreneurial team without including breadth of experience (Gruenhagen *et al.*, 2018; Clark *et al.*, 2018). This relates to heterogeneity in the entrepreneurial team which has shown to influence team processes and performance outcomes. Also, we have investigated a direct link between the characteristics of the entrepreneurial team and the ventures' international performance. Accounting for strategy-related mediators or moderators would help understand contingencies better. This also holds for external contingencies such as, for example, regional export intensities or eco-systems that have been shown to influence internationalization or country affiliation.

Notwithstanding these limitations, with consideration of only one driver - the teams' prior experiences - our model explains more than 20 % of the variability in the speed to reaching significant (25 percent) foreign sales.

In summarizing our findings, it can be said that entrepreneurial team characteristics, i.e. their prior experience and specific knowledge, influence the speed to reaching significant foreign sales. Based on the premises of the UET, the many facets of experiential knowledge found relevant for individuals have been theorized and empirically investigated for teams and transferred to the context of international new ventures. OLS regression was used to examine the linear relationship between the characteristics of the entrepreneurial team and the speed of reaching 25 percent of export intensity. While we found prior industry experience to exert a significant positive effect on such speed, prior international experience showed, much to our surprise, a significantly negative effect. Prior experience in export/import-related functions and experience in a MNE proved to be insignificant, as did the number of languages spoken.

Prior industry experience is rarely accounted for in IE work, which predominantly discusses international work or study experience. In the light of our findings, industry experience may 'overrule' international experience or be in partial overlap, given the operationalizations of the concept. Alternatively, highly internationally experienced entrepreneurs may be more open to taking on more commitment or to taking bigger steps in terms of market selection which may mean slowing down the overall speed of reaching export intensity. Gabrielsson et al (2008) and Luostarinen and Gabrielsson (2006) emphasized these considerations for new ventures rather than focusing on reaching a numeric foreign sales threshold only. Against the background of UET, and, more in general the premises of bounded rationality, we may conclude that due to high job demand and high latitude of action, the founders' international experience may lead to mental shortcuts that weigh too much on prior experience - which may not be adequate for their current settings and thus slow down their international expansion.

In any case, our findings call for future research which accounts for overall team experience, instead of considering only the individual. Also, the multifaceted nature of experiential knowledge may be investigated further. Overall, the entrepreneurial team should receive the same research attention as is the case for top management teams in larger firms. After all, the effects of entrepreneurial team characteristics on the international performance and overall performance translate into growth and job creation in national economies. Given the importance of SMEs across almost all economies, such work would give valuable advice to policy.

For entrepreneurs and managers our results may constitute a guide on how to form and develop teams that are ready for early and continued international performance.

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Environmental sustainability orientation and ambidextrous green innovation: do the roles of women on corporate boards matter?

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Abstract

Purpose of the paper: This study investigates the relationship between environmental sustainability orientation and green innovation ambidexterity and considers the role of women on corporate boards in moderating this relationship. To this end, a research model was developed according to the Natural Resource Based View Theory and the Upper Echelon Theory.

Methodology: A survey was conducted of 116 listed Italian companies with at least one female director holding a specified role. A moderated hierarchical regression was employed to test the research hypotheses.

Findings: Environmental sustainability orientation positively influences green exploitation innovation and exploration innovation. Moreover, the roles of women on corporate boards strengthen the effect of environmental sustainability orientation on green innovation ambidexterity.

Research limits: The size of the sample and its nature required prudence in generalizing the results to unlisted Italian companies.

Practical implications: Environmental sustainability orientation is an affordable solution to address the innovation paradox, since it contributes to a balance between exploitation and exploration activities. Moreover, a higher number of female directors should be present on the boards of firms that look to improve environmental sustainability by fostering green innovation ambidexterity.

Originality of the paper: Environmental sustainability orientation, green innovation ambidexterity, and women on corporate boards were contextually investigated for the first time. Thus, the study adds a more granular understanding of these constructs through a model that is theoretically derived and empirically examined.

Key words: environmental orientation sustainability; women on corporate boards; green innovation ambidexterity; exploitation innovation; exploration innovation.

1. Introduction

Sustainable development is one of the greatest challenges of the twenty-first century. It arises from a growing awareness of the unsustainability of our dynamic and interconnected world due to, among others, environmental issues such as global warming, climate change resulting from fossil combustion, biodiversity loss, and the need for safe food.

All of these issues are increasingly destroying social, environmental, and economic value. It is worth noting that the speed and ubiquity of unexpected and disruptive critical events, such as the Covid-19 pandemic, have pointed out the pervasiveness of ecological emergencies. Thus, the global pandemic foregrounds the connections among different factors, such as human health and living conditions, threats to economic growth, and environmental degradation (natural resource consumption).

These issues have prompted global stakeholders to call for sustainable business models that are able to shift their focus from short-term value towards corporate environmental activities and their long-term outcomes (Ciasullo *et al.*, 2019; Eide *et al.*, 2020). In this sense, 2020 was a pivotal year for environmental challenges. In 2020, BlackRock (2022) CEO Larry Fink announced that his asset management company would seek to align its portfolio with a net zero economy according to the principle of environmental sustainability. This was supported by a commitment to disclosing environmental-related risks resulting from social, economic, and regulatory pressures.

In the current business climate - characterized by tough competition, rapid technological development, and the changing dynamics of consumer behaviour - innovation plays a pivotal role in contributing to businesses' long-term survival and competitiveness (Pisano, 2015; Ciasullo *et al.*, 2020). In this vein, ambidextrous innovation can support organizations' innovation processes, exploiting their established knowledge, and renewing their knowledge portfolio by searching for new opportunities (Levinthal and March, 1993; Jansen *et al.*, 2006).

The sustainability management literature maintains that green innovation, as a new innovation mode, offers a win-win solution for reducing the conflict between economic development and environmental protection (Leal-Rodríguez *et al.*, 2018). This is due to its peculiarities, which, on the one hand, deal with the ability to merge environmental, technological, legal, and ethical aims, and, on the other, with riskier and more expensive investments (Cainelli *et al.*, 2015). Even though scholars have investigated the antecedents of green innovation, including environmental ethics (Chang, 2011), green suppliers (Weng *et al.*, 2015), environmental regulation (Chan *et al.*, 2016; Zhang *et al.*, 2018), quality management (Li *et al.*, 2018), and absorptive capacity (Aboelmaged and Hashem, 2019), research on the link between environmental sustainability orientation (ESO) and green innovation remains scant. Despite a previous study (Ciasullo *et al.*, 2020) has revealed the existence of this link demonstrating that the board independence strengthens the relationship between environmental sustainability and innovation ambidexterity, further research is needed to understand if and how ESO affects exploitative and exploratory green innovation (Wang *et al.*, 2020).

Conceptually, ESO represents a corporate orientation that approaches business in an environmentally sustainable way (Roxas *et al.*, 2017). Thus, a company can develop and enact its ESO by integrating environmental issues into its corporate culture, decision-making processes, and strategic and business activities (Zwetsloot and van Marrewijk 2004; Linnenluecke and Griffiths 2013). In doing so, the board of directors is a key governing

body for addressing and disclosing environmental issues to both shareholders and other stakeholders (Shaukat *et al.*, 2016), as well as for starting green innovation projects (Berraies and Rejeb, 2019). The board's contribution to sustainability and innovation is linked to its characteristics, including its composition. Its structure is based on size, independence, and diversity. This latter attribute is related to the heterogeneity of its members in terms of gender, age, education, values, personalities, and ethnicity (Galia *et al.*, 2015; Cucari *et al.*, 2018). Board diversity is also considered a key corporate governance mechanism for improving the knowledge, deliberations, and skills needed to handle multi-dimensional and complex corporate issues. Of the different facets of diversity, board gender diversity has been approached as being based on strong social responsiveness to different stakeholder needs and as being able to boost corporate ethical conduct (Glass *et al.*, 2016; Nuber and Velte, 2021).

Board gender diversity, its effect on board functioning, and sustainability issues are at the forefront of issues for scholars, practitioners, and policymakers.

In particular, research in the fields of corporate governance and women on boards has been affected by two main issues.

The first deals with the connections between different sociocultural and psychological attributes and their effect on corporate social/environmental management in terms of performance, reporting, and disclosure. While board gender diversity and corporate social performance are relatively well-researched concepts, the relationship between board gender diversity and environmental performance is still under-investigated (Kassinis *et al.*, 2016; Orazalin *et al.*, 2020).

The second issue focuses on the link between female presence on boards and corporate propensity towards innovation. In this case, a large body of literature reports that gender diversity on boards can positively influence corporate commitment to innovation (Miller and Del Carmen Triana, 2009; Midavaine, Dolfisma, and Aalbers, 2016). Scholars have underlined that firms with a greater female presence among top managers tend to achieve greater success in innovation (Chen *et al.*, 2018). However, female characteristics on boards and their influence on environmental innovation ambidexterity still need further investigation (He *et al.*, 2019; Rejeb *et al.*, 2020; Konadu *et al.*, 2022).

To address these issues and advance the results of a prior study (Ciasullo *et al.*, 2020), this paper aims to further the understanding of the nexus between women's roles on corporate boards, environmental sustainability orientation, and green innovation ambidexterity. This can contribute to more effective responses to global pressures for strategic postures that combine corporate responsibility and competitiveness. To this end, the paper explores the links between environmental sustainability orientation (ESO) and ambidextrous green innovation (AGI) and considers women's roles on boards (WBR) and their ability to moderate these links. Thus, the following research questions arise:

RQ1: Is there a relationship between ESO and AGI?

RQ2: Does WBR affect the relationship between ESO and AGI?

Drawing on the natural-resource-based view (NRBV) theory and the upper echelon theory, a research model was developed highlighting the relationship between the following variables: ESO, AGI, and WBR. The research findings demonstrated the existence of a positive relationship between AGI and WBR, where the latter moderates the relationship itself. The proposed research model was tested with empirical observations collected from a sample of 116 listed Italian companies, based on a moderated hierarchical regression (Baron and Kenny, 1986).

This study offers interesting theoretical and practical implications. First, it addresses a research gap by merging ESO, AGI, and WBR in a single study. Second, quantitative evidence demonstrates that ESO is an antecedent in balancing exploitative and explorative green innovation, which contributes to achieving strategic outcomes and a long-lasting competitive advantage. Third, it found that being influenced by WBR, the effect of ESO on AGI grows along with a better integration of green exploitative and explorative innovation. Consequently, this confirms that women tend to be more sensitive to environmental issues.

This paper is organized as follows: Section 2 reviews the existing literature on ESO, AGI, and WBR. The theoretical background and research hypotheses are presented. Section 3 describes the method, and Section 4 presents the findings. Finally, Section 5 is dedicated to a discussion of the findings and to a presentation of the implications, limitations, and future research paths.

2. Literature review

2.1 Environmental Sustainability orientation (ESO) and ambidextrous green innovation (AGI)

The great challenges of environmental protection and sustainable development have put green innovation at the forefront of academia, industry, and society.

Green innovation refers to “all measures of relevant actors which develop new ideas, behaviours, products and processes, apply or introduce them, and which contribute to a reduction of environmental burdens or to ecologically specified sustainability targets” (Rennings and Rammer, 2011). Similarly, the Eco-Innovation Observatory (EIO) approaches green innovation as “the introduction of any new or significantly improved product (goods or services), process, organizational change or marketing solution that reduces the use of natural resources (including materials, energy, water and land) and decreases the release of harmful substances across the whole life-cycle” (EIO 2011, p. 7). These two definitions suggest that the main difference between innovation, as it is generally intended, and environmental or green innovation is the latter’s orientation towards reducing the negative environmental impact of business activities.

Other peculiarities, such as growing technological complexity, intricate bureaucratic procedures that affect development times, growing operations costs (e.g., related to the environmental audit and assurance)

(Nidumolu *et al.*, 2009; Collins *et al.*, 2010), and a wide range of resources and capabilities (Tseng *et al.*, 2013) add uncertainty to green innovation compared with traditional innovation. However, research on the topic has demonstrated that green innovative companies tend to be more successful (Albort-Morant *et al.*, 2017) and achieve better overall performance than their competitors. This is due to their ability to gain operational advantages that increase performance efficiency (e.g., reducing energy or water use costs or generally reducing waste), market advantages that meet an even more green-oriented demand (e.g., stakeholder satisfaction and trust), and strategic advantages (e.g., more flexibility and competitiveness) (Parboteeah *et al.*, 2012; Akhtar *et al.*, 2020). Green innovation can be classified according to 1) its intensity and 2) its propensity to exploit existing knowledge or explore new knowledge (March, 1991). It follows that, on the one hand, exploitative green innovation relates to the implementation of existing environmental knowledge, capabilities, and practices to improve or change existing green products, services, and business processes. On the other hand, exploratory green innovation relates to the development of environmental knowledge and skills to create new, green-oriented markets, products, services, and processes (Chen, 2008; Chen and Chang, 2013; Leal-Rodríguez *et al.*, 2018).

Businesses should invest in both exploitative and explorative innovation because both contribute to performance improvement and to the businesses' own success (Gupta *et al.*, 2006; Cao *et al.*, 2009). Thus, an overemphasis on exploitative innovation can hint at an ability to adapt to change and can make knowledge obsolete, progressively reducing corporate competitiveness. At the same time, an overemphasis on explorative innovation can cause operational inefficiency and an increase in costs and negative returns, especially when companies act under uncertainty (Tsai and Huang, 2008). Avoiding these negative effects - known as "success trap" (resulting from excessive exploitation) and "failure trap" (resulting from excessive exploration) (Levinthal and March, 1993) - remains a challenge for companies. This challenge implies a need and opportunity to balance exploitative and explorative green strategies in the areas of energy saving, pollution prevention, and environmental quality improvement in one all-encompassing process. This will simultaneously boost economic, social, and ecological value. In other words, exploitative and explorative green innovations should complement one another; thus, balancing their actions would make it possible to merge short-term profits from exploitative innovation with long-term benefits from adaptation to external changes emerging from explorative innovation (Wang and Li, 2008; Schamberger *et al.*, 2013).

In a nutshell, green ambidexterity represents a core dynamic organizational capability that enables companies to add an environment-friendly orientation to their value creation processes (Albertini, 2021). In doing so, companies are also able to use innovation to strengthen their competitive advantage.

ESO implies that companies must integrate environmental issues into their corporate orientation and align and change their strategies to reflect this (Roxas *et al.*, 2017). In other words, ESO represents a firm-

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level strategic construct that leads companies to engage in and commit to environmental issues, resources, activities, processes, and practices. This construct implies a strategic corporate orientation that is reflected in the ability to recognize opportunities for gaining economic, ecological, and societal value by engaging in green activities (Jiang *et al.*, 2018).

This implies that ESO is related to corporates' inclinations towards green activities aimed at innovating, improving proactiveness, and risk-taking. More specifically, innovativeness relates to companies' willingness to change current practices, products, and technologies to capture new green opportunities that often lead to the development and use of new resources. Proactiveness relates to companies' opportunity-seeking orientation, which is the ability to capture new opportunities coming from emerging market demands to gain a competitive advantage. Finally, risk-taking relates to companies' disposition towards investing in green initiatives with indeterminate returns (Brettel *et al.*, 2015).

Exploiting the "pillars" of ESO, such as innovativeness, proactiveness, and risk-taking, can allow to companies to actualise the ambidexterity ability in providing organizational dynamics capabilities essential to challenge short- and long- term changes and in catching new opportunities.

This study assumed the theoretical perspective of the NRBV to better understand the relationship between ESO and AGI. The NRBV (Hart, 1995) represents an extended form of the resource-based view (Barney, 1991) and hypothesizes that companies can gain a sustainable competitive advantage by challenging environmental issues. It also implies that natural constraints can be overcome by employing strategies for product stewardship, pollution prevention, clean technology, and sustainable development (Hart and Dowell, 2011). These strategies lay the foundation for innovations that can improve firms' environmental performance and competitive advantage (King and Lenox, 2002; De Stefano *et al.*, 2016). In this study the reduction of products' environmental impact led to product stewardship, while responsible waste management and the reduction of negative emissions lessened pollution. Finally, the conservation of natural resources and the use of renewable ones inspire management to follow the principles of sustainable development. By proactively promoting each of these strategies, companies focus their business on innovation that enables them to improve competitiveness as well as social and environmental well-being.

The aforementioned discussed arguments led to the formalization of the following hypothesis:

HP1: ESO has a significant positive impact on AGI.

2.2 Moderating effect of women roles on corporate boards

Green innovation ambidexterity builds its foundation on a strategic commitment, for which promotion the board of directors is essential. Thus, the latter can develop effective corporate governance pointing to environmental performance and performing different and interrelated roles (e.g., strategy, service, control). In this sense, diversity and related

board processes are key mechanisms for achieving ecologically and socially responsible governance, which is essential for grasping new business opportunities. Thus, assuming a corporate governance perspective, board diversity does not simply imply gender variety within the board, but it also implies the way in which the different characteristics and expertise of board members contribute to its processes, decision-making, and outcomes.

In recent decades, the promotion of gender equality in boards' composition has attracted growing interest from policymakers, scholars, and the public (Reguera-Alvarado *et al.*, 2017). In particular, the increasing number of women on boards is a mandatory target on many international policymakers' agendas (e.g., quota laws in Italy, Spain, Iceland, France, and Germany, and EU 2026 targets). The application of specific penalties for punishing non-compliance testifies to the importance of the topic. However, it is worth noting that even though the number of female directors is constantly growing, this growth remains limited, and a balanced gender ratio has not been reached (Montera, 2013; Amorelli and García-Sánchez, 2021). To counteract this situation, most research on the topic has underlined that female presence on boards generally results in a different approach to governance and decision-making and has a positive influence on strategic decisions, such as those related to green innovation.

In this vein, the upper echelon theory maintains that corporate performance results from top management's strategic decisions, which are usually made according to their personal background (Hambrick and Mason, 1984; Gyapong, *et al.*, 2021).

This implies that 1) the role of boards of directors is essential for strategic development and implementation, and 2) directors' sociodemographic traits highly influence their decision-making processes. It follows that their unique values, experiences, personalities, and psychological traits adds different perspectives to decision-making, for example, improving communication and taking a critical approach to problems (Nadeem, *et al.*, 2017). This implies that diversity in board composition is crucial for environmental business practices, especially in terms of decisions related to innovation and resource allocation. According to the upper echelon theory, previous research investigated women's distinctive and common traits, underlining that they tend to be more affectionate, helpful, kind, sympathetic, interpersonally sensitive, and concerned about others' welfare than men (Eagly, *et al.*, 2003). Empirical evidence supports this finding for both the general population and corporate executives (Post *et al.*, 2011).

Inter alia, differences also exist between female and male directors' core values. Principally, the former tends to be not only more benevolent and universally concerned but also less power-oriented than the latter (Adams and Funk, 2012).

More specifically, female directors are characterized by a strong orientation towards corporate social responsibility as well as a strong ethical vision and environmental values. Another well-established trait of female leaders is their orientation towards cooperation and collaboration (Eagly, *et al.*, 2003). Female directors tend to be more willing to invest in green innovation thanks to their positive attitude towards collaboration and participative behaviours, which boost managers' engagement in

balancing exploitative and explorative innovation. This can also constrain executives' opportunistic behaviours typical of agency theory. In a similar vein, Griffins *et. al.* (2021) maintain that female directors can reduce the agency problem related to excessive risk-taking and short-term focus, which can negatively affect corporate orientation towards innovation.

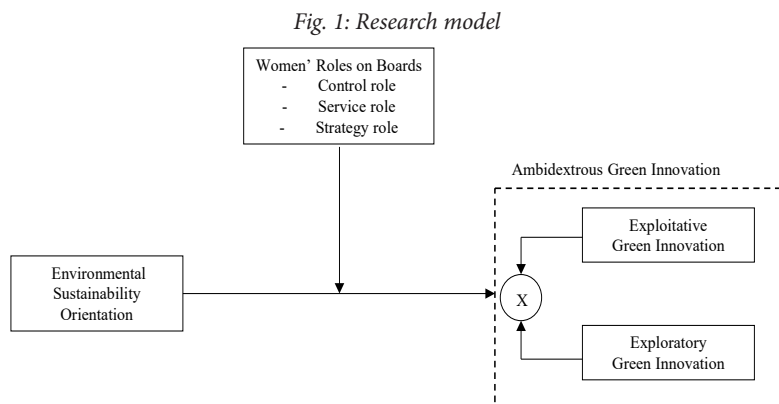
Another important female trait is their relational orientation (Galbreath, 2011). They tend to be more open to mutual understanding, especially about relationships with more influential stakeholders. In this vein, Hussain *et al.* (2018) underlined that female board representatives tend to strengthen stakeholder relationships. This supports managers' initiative and experimentation, as well as their willingness to share information (Arzubiaga *et al.*, 2018; Gul *et al.*, 2011) and prevents them from focusing on exploitation to the detriment of exploration. Acting as a concrete governance mechanism, female directors can share strategic information because they are able to collect and leverage valuable knowledge assets, which can nurture corporate creativity and innovation-driven activities (Campbell and Mínguez-Vera, 2008). Moreover, female presence on boards adds qualities such as, among others, a stronger alignment towards information disclosure, more flexibility, readiness, and problem-solving and team-building abilities. All of these characteristics are essential for a firm to compete in unpredictable scenarios (Vieito, 2012; Liao *et al.*, 2015).

These qualities perhaps allow executive women to act effectively by following divergent thinking processes and making different strategic choices, such as green innovation. This is possible because they can create a collaborative atmosphere that encourages open conversations among a board's members (Bear *et al.*, 2010). In this vein, as an effective strategic mechanism, female executives can solve cognitive conflict among team members by using divergent thinking and assuming an orientation that strategically influences social and environmental issues.

The analysed research led to the following hypothesis:

HP2: WBR positively moderates the relationship between ESO and AGI.

Fig. 1: depicts the research model and hypotheses at the core of this study



Source: Own elaboration

3. Method

3.1 Sample selection

This analysis was conducted using quantitative methods and involved a sample of Italian companies listed on the Milan Stock Exchange. These companies were selected because of the openness and accessibility of their corporate governance information. Moreover, they represent an interesting setting for investigating innovation because their stock quotations provide funds for innovating and, in so doing, for promoting a positive brand image among international investors (Rejeb *et al.*, 2020).

The analysis focused on listed Italian companies to remove any negative effect from cross-national variability. Moreover, listed companies are usually large and are evaluated according to environmental, social, and governance (ESG) ratings (Cucari *et al.*, 2018; Clementino and Perkins, 2020).

Using the Orbis database, a total of 326 listed Italian companies with at least one female director holding a specified role were identified. The formula for a finite population was used to calculate the final sample size. It follows that 1) it was considered satisfactory to set a confidence level at 95% (standard value of 1.96), 2) a standard deviation of 0.5 resulted from a pilot survey conducted on a small number of units, and 3) 5% was considered the allowable error. After this, the representative sample of the analysed population was 211 companies (units), which were mostly large (55.2%) and active in the manufacturing sector (50.6%), and the remainder in the service sector to firms and to persons (43.3%) and services exclusively to persons (6.1%).

3.2 Data collection and analysis

Data were collected over a three-month period (December 2019 to March 2020) using a survey aligned with the research purpose. Participants were selected by consulting the Orbis database and surfing corporate websites. They comprised senior environmental managers, R&D managers, board members, and board secretaries, who were first contacted via LinkedIn and then received information via email about the research project and about participation in the online survey. The survey was created and administered using the Qualtrics platform. It was written in Italian, and it included 33 closed questions, organized into 5 sections. The first contained a brief description of the survey's aim, the researchers' identities, the average time needed to fill it out, and the policies for data use and privacy. The second section was made up of 6 questions, 3 of which aimed at shaping the sample profile (industry/sector, board size, and presence of a corporate social responsibility or CSR committee), and the remaining 3 at shaping the respondents' profile (age, education, and years of seniority in the top management team or TMT). The next section was built around 4 questions dealing with ESO and 5 questions dealing with environmental dynamism.

The fourth section was made up of 8 questions dedicated to AGI, with 4 for each type of innovation. Finally, the fifth section included 10 questions

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on WBR. Before launching the full-scale formal survey, a pilot test was conducted involving a convenience sample of 20 executives to evaluate the response latency and check question comprehension (Lavrakas, 2008).

A total of 118 responses were collected, of which 2 were rejected due to their incompleteness or to some response set bias. It follows that 116 valid responses were collected, representing a response rate of 54.9%. The collected data were analysed through a moderated hierarchical regression performed using the SPSS v22 software package.

3.3 Measures

Independent variable. ESO is considered the independent variable of the model. Drawing on the sustainability orientation scale of Jagani and Hong (2022), the environmental sustainability orientation measurement is taken into consideration in line with the research purpose. It includes four items (Table 1) that were scored on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Tab. 1: Measurement items

Environmental Sustainability orientation (ESO) (adapted from Jagani and Hong, 2022) ESO1 - Our firm has strategic plans to minimize hazardous waste throughout work processes ESO2 - Our firm communicates green sourcing policies for all suppliers ESO3 - Our firm provides education and training for responsible stewardship of raw materials ESO4 - Our firm supports achieving broad environmental goals (e.g., combat climate change)
Exploitative green innovation (EIGI) (adopted from Wang <i>et al.</i> , 2020) EIGI1 - Our firm actively improves current green products, processes and services EIGI2 - Our firm actively adjusts current green products, processes and services EIGI3 - Our firm actively strengthens current green market EIGI4 - Our firm actively strengthens current green technology
Exploratory green innovation (ERGI) (adopted from Wang <i>et al.</i> , 2020) ERGI1 - Our firm actively adopts new green products, processes and services ERGI2 - Our firm actively exploits new green products, processes and services ERGI3 - Our firm actively discovers new green market ERGI4 - Our firm actively enters new green technology
Women Board's roles (adapted from Rejeb <i>et al.</i> , 2020) <i>Strategy role (STR)</i> STR1 - In our firm, women on board formulate and/or approve strategy STR2 - In our firm, women on board define business vision, mission statement and long-term objectives STR3 - In our firm, women on board identify new strategic opportunities <i>Control role (CR)</i> CR1 - In our firm, women on board monitor management performance CR2 - In our firm, women on board increase shareholder value CR3 - In our firm, women on board evaluate and reward top management CR4 - In our firm, women on board appoint new managers <i>Service role (SVR)</i> SVR1 - In our firm, women on board advise management team SVR2 - In our firm, women on board establish network and maintain relations with the environment SVR3 - In our firm, women on board assist and motivate management team
Environmental Dynamism (adopted from Jansen <i>et al.</i> , 2006) ED1 - Environmental changes in our local market are intense ED2 - Our clients regularly ask for new products and services ED3 - In our local market, changes are taking place continuously ED4 - In a year, our market has changed a lot ED5 - In our market, the volumes of products and services to be delivered change fast and often

Source: Own elaboration

Dependent variable. Ambidextrous green innovation was the dependent variable of the model. It is measured by two dimensions of exploitative (EIGI) and exploratory (ERGI) green innovation, as adopted from Wang *et al.* (2020) (Tab. 1). The dimensions of ambidextrous green innovation were measured using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Moderating variables. Women's roles on boards were the moderating variable of the model. The relative scale was adopted from Rejeb *et al.* (2020). It includes strategy (three items), control (four items), and service (three items) roles (Table 1), which were scored on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Control variables. To support the robustness of research findings and improve their explanatory strength, control variables were added by grouping three categories (i.e., contextual factors, firm level, and internal factors) that the literature considers as factors affecting green innovation (He and Jiang, 2019). Regarding contextual factors, we controlled for environmental dynamism because environmental aspects matter in the context of innovation ambidexterity (Jansen *et al.*, 2006; Lavie *et al.*, 2010). To measure environmental dynamism, Jansen *et al.*'s (2006) scale was adopted. It includes 5 items (Table 1) that were scored on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). At the firm level, we controlled for board size - assessed by the logarithm of the total number of directors (Duque-Grisales *et al.*, 2020) - because prior studies have considered its influence on ambidextrous innovation (Raisch and Birkinshaw, 2008; Berraies and Rejeb, 2019). The CSR committee was also controlled for - as a dummy variable which takes the value of 1 if the company has a CSR committee and 0 otherwise - since it enhances awareness of environmental issues (Liao *et al.*, 2015). Regarding the internal factors, we controlled for TMT tenure, education, and age, which are linked to the successful adoption and implementation of policies related to environmental sustainability (Naranjo-Gil, 2016; Wiengarten *et al.*, 2017). TMT tenure was assessed by the number of months respondents had worked as part of a TMT (Lubatkin *et al.*, 2006). TMT education is evaluated in terms of primary school, high school, undergraduate, master's, and PhD, while TMT age is measured by the years of TMT's members (Jahanshahi and Brem, 2017).

3.4 Reliability and validity

The Cronbach's alpha value of every variable is well above the cut-off point of 0.7, indicating that our theoretical constructs exhibit good internal reliability (Nunnally, 1978). In addition, convergent validity is ensured, as demonstrated by (1) the composite reliability (CR) that exceeds 0.7; (2) the average variance extracted (AVE) for each construct that exceeds 0.5; and (3) the CR that is higher than the AVE for each construct (Hair *et al.*, 1998) (see Table 2).

Tab. 2: Reliability and construct validity

Variables	Cronbach's α	AVE	CR
ESO	0.90	0.68	0.76
EIGI	0.85	0.73	0.91
ERGI	0.91	0.62	0.83
STR	0.93	0.59	0.78
CR	0.92	0.64	0.77
SVR	0.96	0.82	0.95

Note. AVE = average variance extracted; CR = composite reliability

Source: Own elaboration

4. Results

Descriptive statistics and correlations for each of study variables are reported in Table 3. The modest correlation coefficients of the variables suggest that multicollinearity should not be an issue.

Tab. 3: Descriptive statistics and correlation matrix

Variables	M	SD	1	2	3	4	5	6
1. ESO	4.91	1.18	1					
2. EIGI	0.52	0.50	0.125*	1				
3. ERGI	5.31	0.99	0.236**	0.257**	1			
4. STR	0.49	0.50	0.067	0.050	0.155	1		
5. CR	8.74	17.80	0.175**	0.167**	0.030	0.106	1	
6. SVR	0.49	0.50	0.067	0.050	0.155	0.069	-0.121*	1

** $p < 0.01$; * $p < 0.05$.

Note. M = mean; SD = standard deviation

Source: Own elaboration

Prior to the regression analyses the independent and moderator variables were mean-centred according to the recommendations of Aiken and West (1991). In doing so, problems of multicollinearity between the explanatory variables and the interaction terms are eliminated and more easily interpretable estimations can be obtained. To test the hypotheses, a moderated hierarchical regression was used (Baron and Kenny, 1986). The results are reported in Table 4 and Table 5 according to the four steps for each dimension of ambidextrous green innovation. In particular, the variables were introduced as Cohen *et al.* (2003) suggested: first the control variables (Model 1), then the independent variable (Model 2), followed by the moderator variables (Model 3), and finally the variables representing the interaction effects (Model 4).

Tab. 4: Results of regression analysis of EIGI

Variables	EIGI			
	Model 1	Model 2	Model 3	Model 4
Board size	0.18*	0.24**	0.17**	0.22*
CSR committee	0.12	0.29**	0.15	0.08
TMT tenure	0.07	-0.13	0.11	0.04
TMT age	-0.20	0.05	0.09	0.30**
TMT education	0.10	0.09	0.12	0.24*
Environmental dynamism	0.31**	0.19***	0.24**	0.16***
ESO		0.33***	0.25*	0.22**
STR			0.08	0.01
CR			0.03	0.06
SVR			-0.09	0.13
ESO x STR				0.27***
ESO x CR				0.38*
ESO x SVR				0.32**
F	1.356	19.080	0.048	2.776
R ²	0.059	0.143	0.143	0.156

*p < 0.10, **p < 0.05, ***p < 0.01.

Note. Standardized coefficients are reported

Source: Own elaboration

Tab. 5: Results of regression analysis of ERGI

Variables	EIGI			
	Model 1	Model 2	Model 3	Model 4
Board size	0.20**	0.17*	0.21***	0.19**
CSR committee	0.16	0.26***	0.18	0.11
TMT tenure	0.10	0.08	-0.05	0.07
TMT age	-0.01	0.03	0.08	0.28*
TMT education	0.06	-0.16	0.02	0.25**
Environmental dynamism	0.34***	0.25**	0.31**	0.24*
ESO		0.29*	0.20***	0.23**
STR			0.15	-0.22
CR			0.08	0.10
SVR			0.03	0.11
ESO x STR				0.34**
ESO x CR				0.29*
ESO x SVR				0.36***
F	1.701	17.772	0.045	5.887
R ²	0.073	0.151	0.151	0.176

*p < 0.10, **p < 0.05, ***p < 0.01.

Note. Standardized coefficients are reported

Source: Own elaboration

Model 1 of Tables 4 and 5 highlights a positive and significant influence of board size for both exploitative ($\beta = 0.18$, $p < 0.10$) and exploratory ($\beta = 0.20$, $p < 0.05$) green innovation. A larger board size seems to lead to the achievement of ambidextrous green innovation. In addition, environmental turbulence has a statistically significant influence on exploitative ($\beta = 0.31$, $p < 0.05$) and exploratory ($\beta = 0.34$, $p < 0.01$) green innovation, indicating that the contextual dynamism pushes boards to pursue ambidextrous green innovation.

Model 2 allowed us to test Hypothesis 1. A positive relationship between environmental sustainability orientation and exploitative green innovation ($\beta = 0.33$, $p < 0.01$) (Table 4) and between environmental sustainability orientation and exploratory green innovation ($\beta = 0.29$, $p < 0.10$) (Table 5) can be observed by confirming Hypothesis 1. An increase in environmental sustainability orientation will thus enhance a firm's opportunities to pursue green innovation in an ambidextrous way. Further, the variable of CSR committee in this model shows a positive, statistically significant influence on exploitative ($\beta = 0.29$, $p < 0.05$) (Table 4) and exploratory ($\beta = 0.26$, $p < 0.01$) (Table 5) green innovation, indicating that the presence of a CSR committee influences the development of ambidextrous green innovation in the listed Italian companies.

In Model 3, the variables of the strategy, control, and service roles of women on corporate boards are added and show no direct significant effect of these roles on either exploitative or exploratory green innovation. Thus, the interaction effect of women's roles on boards with environmental sustainability orientation and ambidextrous green innovation is expected to be significant.

Model 4 introduces the interaction of women's roles on boards with environmental sustainability orientation and ambidextrous green innovation. The results indicate the presence of a pure moderating effect of women's roles on boards on the main relationship, since the direct effect of this variable on exploitative or exploratory green innovation is not significant, whereas the interaction terms for exploitative green innovation (ESO x STR: $\beta = 0.27$; $p < 0.01$; ESO x CR: $\beta = 0.38$; $p < 0.10$; ESO x SVR: $\beta = 0.32$; $p < 0.05$) (Table 4) and exploratory green innovation ESO x STR: $\beta = 0.34$; $p < 0.05$; ESO x CR: $\beta = 0.29$; $p < 0.10$; ESO x SVR: $\beta = 0.36$; $p < 0.01$) (Table 5) are significant. Thus, Hypothesis 2 is confirmed, since women's roles on boards increase the positive effect of environmental sustainability orientation on ambidextrous green innovation. Further, the variables of TMT age and education in this model show a positive, statistically significant influence on the relationship between environmental sustainability orientation and exploitative or exploratory green innovation (TMT age: $\beta = 0.30$, $p < 0.05$; TMT education: $\beta = 0.24$, $p < 0.10$) (Table 4) and exploratory (TMT age: $\beta = 0.28$, $p < 0.10$; TMT education: $\beta = 0.25$, $p < 0.05$) (Table 5) green innovation. These results indicate that the presence on boards of older women and those with higher education is important to enhance ambidextrous green innovation.

5. Discussion and conclusion

This study aims to shed further light on the influence that environmental sustainability orientation plays on ambidextrous green innovation by investigating the moderating effect that a board's roles, and in particular female members, have on this relationship.

The originality of this research lies in approaching these themes that are so essential for the current socio-economic dynamics in an integrated way and thus contributing to bridging two major research gaps. Indeed, on

the one hand this paper responds to the call for further empirical research on the relationship between sustainability orientation and ambidexterity innovation (Sulphrey and Alkahthani, 2017) and on the other, to a recent call for further theoretical research on sources of environmental sustainability orientation (Ameer and Khan, 2022). Therefore, through the empirical implementation of a research model built upon a review of the extant literature, this paper offers a more granular comprehension of environmental sustainability, ambidexterity innovation, and gender diversity on boards.

Drawing on theoretical insights from the natural-resource-based view and the upper echelon theory, this research demonstrates that ESO positively affects ambidextrous green innovation. This prediction is strongly supported by the results empirically achieved. Thus, ESO not only acts as a lever of sustainability performance, but also as an antecedent to balance green exploitative and exploratory innovation. It follows that ESO represents a strategic mechanism to solve tensions related to the exploitation-exploration paradox in firms' innovations (Zeng *et al.*, 2017). This is due to its capability to boost the joint pursuit of these two contradictory activities. However, this balance does not represent a bland compromise, but rather an excellent integration of exploitation and exploration (Andriopoulos and Lewis, 2009) in which women's roles on boards are essential for balancing the two dimensions of green innovation. Research findings demonstrated that ESO influence on ambidextrous green innovation grows together with the growth of female roles on boards.

Female directors contribute to a board's service role, making the relationship between ESO and the two dimensions of green innovation stronger.

In this sense, women on boards shape relational leadership by adopting more participative and democratic styles than their male counterparts. This creates a climate that is supportive of innovation. Moreover, the presence on boards of older women and those with higher education enhances boards' commitment to sustainability. These two elements lead to valuable governance mechanisms that increase corporates' capacity to scan green opportunities, which has the effect of favouring ambidextrous green innovation. Indeed, the strategic role makes the relationship between ESO and explorative green innovation stronger. In line with previous research, gender diversity on boards represents a pool of resources because a growing heterogeneity leads to more knowledge, competencies, and skills (Amran *et al.*, 2014; Cucari *et al.*, 2018) that are useful for environmental sustainability and for ambidexterity innovation.

Therefore, advancing research on the topic has led to a definition of female executives as "eco-influencers" of other board members because they boost creativity and promote new ideas, thus encouraging environmentally and sustainability-oriented decision-making processes. Moreover, in balancing the two dimensions of innovation, gender diversity can act as a turning point in solving conflicting interests and opposing visions in top management teams. This becomes possible by nurturing a more agile decision-making environment characterized by better information sharing and a stronger commitment to the organization. It follows that

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even though gender diversity can contribute to proactive environmental strategies, its implementation depends on an embedded corporate environmental sustainability orientation among all the board's members. Indeed, the research findings emphasize that the control role affects only the relationship between ESO and exploitative green innovation. This shows that agency problems have not yet been solved, especially in terms of male executives' opportunistic behaviour.

Drawing on these considerations, it is worth noting that it is not the structural dimension of the board but rather the quality of the related governance mechanisms that affects green ambidextrous innovation. This is in line with scholars who underlined that women, by offering boards a wider and more varied approach, contribute to the enactment of innovation strategies to solve tensions and reduce the conflict between economic development and environmental protection (Konadu *et al.*, 2022).

This paper offers three main theoretical implications. First, NRBV theory and upper echelon theory represent the theoretical basis of this research, while most previous studies on environmental issues and corporate governance have adopted a single theoretical lens (Luo and Tang, 2014; McGuinness *et al.*, 2017). Thereby, a more focused approach is embraced that better explains the relationship between natural environmental constraints, specific governance characteristics, and exploitative and explorative green innovation. Second, the research contributes to the literature on corporate governance by emphasizing the importance of women's roles on boards as valuable mechanisms of governance to boost the effect of ESO on ambidextrous innovation. Thus, the most important tasks in charge of women executives enhance the contribution of ESO to the implementation of the two types of green innovation. Third, this research contributes to the innovation management literature. This comes from the empirical evidence that led us to consider ESO as a new antecedent of ambidextrous green innovation as a key corporate dynamic capability.

Finally, this study also offers interesting managerial implications. It suggests that companies willing to improve the effectiveness of their environmental decisions by fostering innovation tend to pay more attention to board composition. Particularly, women who perform service roles should be recruited onto boards because their alternative viewpoints and fresh strategic perspectives on ESO support male executive directors' engagement in exploratory innovative projects rather than in exploitative ones. In doing so, female executives promote decision-making processes that can boost the achievement of an organization's competitive edge. This emphasizes the current strategic perspective, which focuses on the need for agile decision-making. Therefore, according to research findings on strategic decisions and resource allocation processes, top executives must merge proactivity and sustainability through adaptation tactics and long-term commitments.

In addition, the study demonstrates that CSR committee does not influence the ambidextrous green innovation when there are women on corporate boards thus suggesting that female directors influence various board decisions and particularly decisions to implement in practice environmental projects. Thus, business practitioners and policymakers

should leverage on the female presence in the governance structure because of their ethical, moral, and social values that affect a social oriented view of businesses and a responsible management, thus encouraging the CSR engagement of firms regardless of whether CSR committees exist or do not. Accordingly, women on board could act as insurance mechanism both for sustainable investors in allocating their capital or investing into green portfolio, and for a broad range of stakeholders to resolve social threats, like environmental ones, gaining more trust from them.

Despite these contributions and implications, this research is not without limitations. First, the survey was conducted on just 116 listed Italian businesses. Consequently, the sample size and its nature can affect the findings' generalizability to unlisted Italian firms. Second, future research should design cross-country studies to compare the relationship between ESO, ambidextrous green innovation, and women's roles on boards in different national and international settings.

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Mobile shopping behavior: a bibliometric analysis

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Abstract

Frame of the research: *The increase in the penetration rate of smartphones (3 billion smartphone users in 2020), together with the spread of broadband connectivity, represents a driving force for e-commerce that will increasingly be supported by mobile technology. By the end of 2021, 72.9% of global e-commerce sales will be generated via m-commerce and that by 2023 m-commerce will increase by 250% from 1.9 trillion US dollars in 2018 to 4.3 trillion US dollars. In light of these considerations, it is not surprising that, in the last two decades, research on m-commerce and the factors that determine its use has increased considerably*

Objectives: *The work aims to provide a systematization of research on the topic of mobile commerce through a bibliometric analysis of the literature on m-commerce from a consumer behavior perspective in order to identify the most studied and emerging strands, which may represent future areas of research as well as useful directions for manufacturers and retailers that intend to develop m-commerce and omnichannel management strategies.*

Methodology: *The work is based on a bibliometric analysis of the literature on mobile commerce from a consumer behavior perspective analyzing the contributions published from January 2000 to July 2020.*

The research was carried out following two phases: identifying contributions through the online database Web of Science (WoS) and bibliometric analysis through SciMAT.

Findings: *The results of a bibliometric analysis conducted on the research contributions of the last 20 years provide a clear picture of future research directions and the areas on which companies will have to focus in the development of omnichannel business models.*

Through the WoS database, 275 articles were collected, then analyzed with SciMAT in the two time periods 2000–2015 and 2016–2020. In the first period, contributions focused on identifying the antecedents of mobile commerce adoption and its relationships with trust, loyalty and customer satisfaction and its repeated use. In the second period, the focus was on interaction with other channels, with a multichannel and omnichannel perspective.

Research limits: *Although WoS is considered the most suitable data source for most publications, some contributions included in other databases may have been overlooked. In addition, the research does not take into account the contributions of the whole of 2020, which was most impacted by the effects of the COVID-19 pandemic.*

Practical implications: *From a research perspective, it is possible to draw up the evolutionary picture of the topic, identifying the most covered and emerging strands representing valid opportunities for future research. From a managerial perspective, the research systematizes the results of existing studies by providing useful indications on mobile commerce strategies in retailing.*

Originality of the paper: *With reference to the wide literature on mobile commerce, the research provides a first systematization of the contributions developed in the last 20 years and provides interesting insights for future research and managerial practices.*

Key words: *mobile commerce; shopper behavior; bibliometric analysis; digital; SciMAT*

1. Introduction and theoretical background

The growing prevalence of mobile devices has not only changed the way individuals interact and communicate, but has profoundly transformed consumers' shopping habits, drawing the attention of consumer behavior scholars.

In 2020, there were over 3 billion smartphone users, a number that is set to increase with the evolution of technology and the impact of 5G on connectivity levels (Statista, 2020a). Mobile devices enable individuals to perform various functions, from a widespread search for information before purchasing a product or service to conducting real commercial transactions, such as buying products and services, and paying bills. The increase in the penetration rate of smartphones, together with the spread of broadband connectivity, represent a driving force for e-commerce that will increasingly be supported by mobile technology.

Mobile commerce (m-commerce) is a major field in the marketing literature; it comprises any research, evaluation or monetary transaction activity related to the purchase of goods or services through mobile or cellular devices connected to the Internet or through the wireless telecommunications network (Clarke, 2001; Ko *et al.*, 2009; Lai *et al.*, 2012). In a broader sense, m-commerce can be considered a service that offers individuals the ability to gather information from multiple sources, check the availability of a product or service, and evaluate special offers and alternatives at any time throughout their customer journey (Lai *et al.*, 2012). According to this perspective, m-commerce is interpreted as an extension of e-commerce and as a separate and autonomous marketing channel capable of creating new value for customers (Kleijnen *et al.*, 2007; Choi, 2018). This is due to its distinctive features of mobility and flexibility, which make it usable anywhere and at any time (Rodríguez-Torrice *et al.*, 2019; Yun *et al.*, 2011).

It is estimated that by the end of 2021, 72.9% of global e-commerce sales will be generated via m-commerce and that by 2023 m-commerce will increase by 250% from 1.9 trillion US dollars in 2018 to 4.3 trillion US dollars (Statista, 2020a). This is a forecast that will probably have to be revised upward following the effects of the COVID-19 pandemic on the purchasing behavior of individuals. The restrictions activated to contain the health emergency, together with individuals' reluctance to make purchases in physical stores and their growing familiarity with smartphones, further accelerated the spread of m-commerce, leading many companies, especially retail, to review their business models. As of

June 2020, global m-commerce traffic reached 22 billion monthly visits, with exceptionally high demand for grocery, apparel and technology items (Statista, 2020b).

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In light of these considerations, it is not surprising that, in the last two decades, research on m-commerce and the factors that determine its use has increased considerably (Yang, 2010; Li *et al.*, 2012; Yang and Kim, 2012; Kumar and Mukherjee, 2013). Specifically, research has focused on the adoption and use of mobile technology on the one hand (Wu and Wang, 2005; Kim *et al.*, 2009; Yang, 2012; Agrebi and Jallais, 2015; Groß, 2015) and on the intentions and motivations of mobile shopping on the other hand (Yang, 2010; Li *et al.*, 2012; Yang and Kim, 2012; Kumar and Mukherjee, 2013).

In particular, in the context of the first strand of research, several theories were used to explain the technological determinants of m-commerce: *Innovation Diffusion Theory* by Rogers (1983, 2010) and Moore and Benbasat (1991), *Technology Acceptance Model* (TAM) by Davis *et al.* (1989), *Theory of Reasoned Action* by Fishbein and Ajzen (1975), *Theory of Planned Behavior* by Ajzen (1991), *Unified Theory of Acceptance and Use of Technology* (UTAUT) by Venkatesh *et al.* (2003) and its extension UTAUT2 by Venkatesh *et al.* (2012).

In terms of the second strand, several contributions showed how purchase motivations change depending on the context and the reference time period (Gupta and Arora, 2017; Madan and Yadav, 2018). Several authors focused on the role of utilitarian factors, such as efficiency, accessibility, perception of utility, ease of use and convenience (Davis *et al.*, 1989; Groß, 2015), while others investigated the influence of hedonistic dimensions, such as the perception of pleasure in the use of mobile devices (Li *et al.*, 2012). Finally, some authors stated that both utilitarian and hedonistic factors contribute to consumers' intentions and motivations to adopt and use smartphones for shopping activities (Yang and Kim, 2012).

Despite the increasing attention paid to m-commerce and the proliferation of studies on the topic, there are few qualitative and quantitative reviews or systematizations of the m-commerce literature (Zhang *et al.*, 2012; Groß, 2015; Natarajan *et al.*, 2017). Given this, in the context of the relevance and dynamism of m-commerce, a systematization of research contributions on this topic would update and expand knowledge of purchasing behavior in the digital context and would orientate future research and managerial practices.

The present work aims, therefore, to carry out a bibliometric analysis of the literature on m-commerce from a consumer behavior perspective by examining relevant articles published in the last 20 years (from January 2000 to July 2020). Bibliometric analysis enables the tracing of an evolutionary framework for a topic to identify the most studied and emerging strands, which may represent future areas of research. From a managerial point of view, the results of this research can provide useful information for manufacturers and retailers intend to develop m-commerce and omnichannel management strategies.

2. Methodology

In order to analyze the literature produced so far on the topic of m-commerce from a consumer behavior perspective, a quantitative approach based on bibliometric analysis was adopted. Founded in the 1920s, the methodology for bibliometric analysis has recently developed as a result of the greater availability of large online databases that allow the archiving of a large number of scientific publications (Gutiérrez-Salcedo *et al.*, 2018). Bibliometric analysis allows a systematic and orderly review of the existing literature on a subject; it can be divided into two macro-areas: performance analysis and scientific mapping analysis (SMA) (Noyons *et al.*, 1999). The first, through the use of bibliometric indexes based on citations and publication data, aims to evaluate from a descriptive point of view the characteristics of the contributions (e.g., typology, journal, citations, country) (Narin and Hamilton, 1996); the second (SMA) focuses on the monitoring of a scientific field and on the definition of research areas in order to identify, through an analysis of the contents, the structural and evolutionary aspect of the phenomenon under consideration (Noyons *et al.*, 1999; Börner *et al.*, 2003). Bibliometric mapping is a spatial representation of how disciplines, research strands and contributions or authors are related to each other (Cobo *et al.*, 2012; Martínez *et al.*, 2015).

For this research, the performance analysis was carried out using the online database Web of Science™ (WoS), while the open source bibliometric software SciMAT 1.1.04 was used to develop a longitudinal analysis of scientific mapping based on co-word analysis: a consolidated content analysis technique used for the study of co-occurrences of keywords in order to obtain a graphical visualization useful for data analysis (Callon, 1983; Cobo *et al.*, 2012; Batagelj and Cerinsek, 2013). Moreover, SciMAT enables identification of the associations and interactions between the various lines of research in order to identify mature and emerging lines and trace their temporal evolution (Callon *et al.*, 1991). In this way, analyses carried out through SciMAT, combining both performance analysis tools and scientific mapping tools, allowed the researchers to analyze all aspects of m-commerce through an analysis of contributions held in specific online databases; in particular, analyses allowed the detection and visualization of the conceptual topics or general thematic areas of m-commerce and its thematic evolution (Cobo *et al.*, 2012).

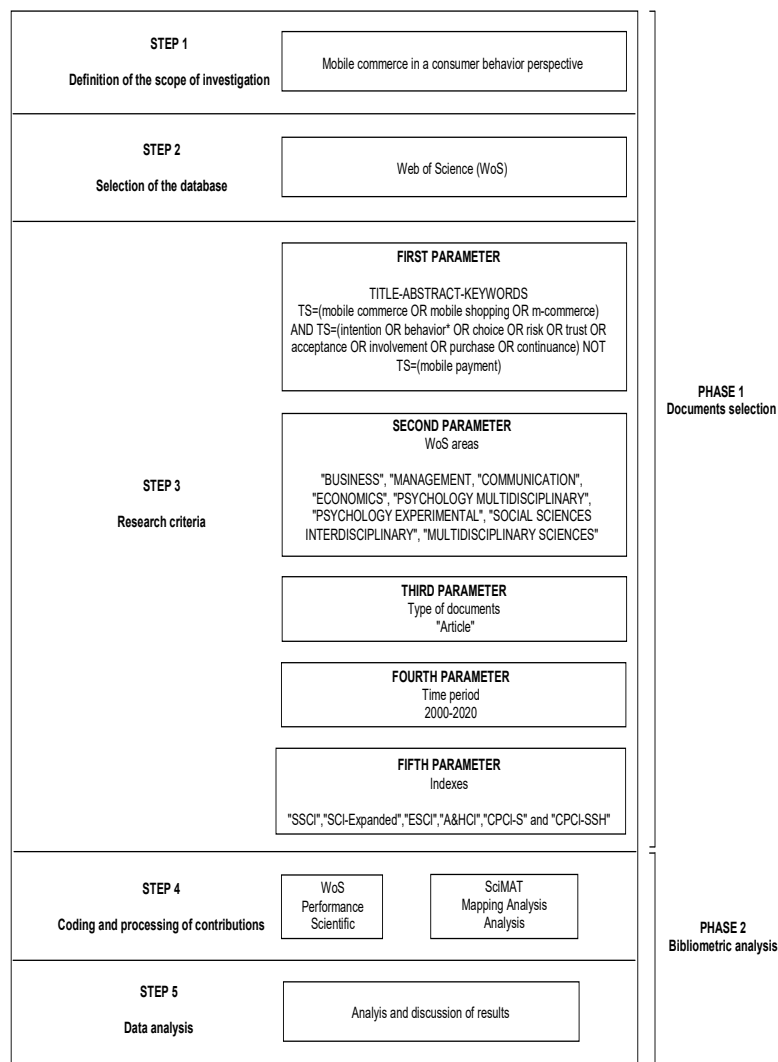
Compared to other scientific mapping software, SciMAT has three key features: first, it allows a powerful pre-processing that leads to data reduction (it detects duplicate elements and spelling errors), which is useful for cleaning raw bibliographic data; second, it makes it possible to carry out scientific mapping studies using a longitudinal framework (Price and Gürsey, 1975; Garfield, 1994) and build scientific maps enriched with bibliometric indexes such as the sum, maximum, minimum or average number of citations received, rather than more robust analyses and indices such as the *H index* (Hirsch, 2005; Alonso *et al.*, 2009, 2010) and *co-word analysis* (Callon *et al.*, 1983); third, it includes a wizard that allows the user to configure the different stages of scientific mapping.

The present work has been structured in two phases consisting of: (1) the identification of the scientific contributions of interest (from January 2000 to July 2020) through the WoS database and (2) the bibliometric analysis through SciMAT, starting from the necessary process of standardization of documents and keywords. Specifically, according to a consolidated approach given in the literature (Castillo-Vergara *et al.*, 2018; Capobianco-Uriarte *et al.*, 2019), the research followed the following steps (Fig. 1):

- for phase 1, (1) definition of the scope of investigation, (2) selection of the database, (3) definition of search criteria;
- for phase 2, (4) coding and processing of contributions, (5) data analysis.

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Fig. 1: Bibliometric analysis process



Source: authors' elaboration

2.1 Phase 1 - Documents selection

First, the scope of the research was defined (step 1): m-commerce according to a consumer behavior perspective. Subsequently, WoS was selected as a bibliographic research platform for the research of scientific contributions (step 2). We chose WoS because it is a particularly appropriate database for conducting bibliometric studies since it is the most complete with reference to social science studies and makes available several citation indexes (Norris and Oppenheim, 2007; Waltman, 2016).

The selection of the documents took place in July 2020 through the definition of the search criteria (step 3). In particular, the search for scientific contributions was carried out through the use of a precise query that included some keywords that the documents had to express. The time horizon (2000-2020), the type of contribution requested and the research areas within which to search for compatible documents were also set. The final query was as follows: TS=(mobile commerce OR mobile shopping OR m-commerce) AND TS=(intention OR behavior* OR choice OR risk OR trust OR acceptance OR involvement OR purchase OR continuance) NOT TS=(mobile payment) in "TITLE-ABSTRACT-KEYWORD". To refine the research, the categories "BUSINESS," "MANAGEMENT," "COMMUNICATION," "ECONOMICS," "PSYCHOLOGY MULTIDISCIPLINARY," "PSYCHOLOGY EXPERIMENTAL," "SOCIAL SCIENCES INTERDISCIPLINARY" and "MULTIDISCIPLINARY SCIENCES" for the period 2000-2020 were selected. Contributions were also requested from multidisciplinary databases: Social Science Citation Index (SSCI), Science Citation Index Expanded (SCI-Expanded), Emerging Sources Citation Index (ESCI), A&HCI, CPCI-S and CPCI-SSH. For the type of document, the category "ARTICLES" was taken into account.

The search identified 890 publications from January 2000 to July 2020, of which, following further skimming on the basis of the topic covered, 275 publications were selected for analysis.

2.2 Phase 2 - Bibliometric analysis

As suggested by previous research (Noyons *et al.*, 1999), bibliometric analysis (step 4) was divided into two macro-areas: first, a performance analysis was conducted and second, scientific mapping (SMA) was developed.

With regard to performance analysis, the characteristics of the contributions (citations, country) were evaluated through WoS from a descriptive point of view (Narin and Hamilton, 1996). Specifically, all the trends of publications over time (2000-2020), the number of publications by country and the ranking of the most cited articles in the literature on the subject were studied through bibliometric indexes based on citations and data relating to publications.

Moreover, with regard to SMA, the structural and evolutionary aspect of the field of investigation was identified through content analysis (Börner *et al.*, 2003). Specifically, to perform the scientific mapping, SciMAT software

was used by dividing the contributions into two time periods: 2000-2015 and 2016-2020. This division reflects a technological criterion according to the intuition that the evolution of technology has driven the advent and spread of shopping through mobile devices. Specifically, the period from 2000 to 2015 sees the gradual transition from “traditional” to “modern” technologies, characterized by the advent of iPhones, smartphones and 4G; the years from 2016 to today see the proliferation of mobile applications, the advent of a new generation of mobile devices and 5G connection, and the creation of websites optimized for mobile browsing. The first period (2000-2015) is longer than the second because, as suggested by previous research (Cobo *et al.*, 2011), in longitudinal studies applying *co-words analysis*, the first period of time analyzed should generally be longer than the others in order to collect a sufficient number of published scientific contributions. The last period can be shorter and is useful for providing interesting indications for the identification of future research opportunities (Cobo *et al.*, 2011).

On the basis of the established periods, the bibliometric analysis was conducted in which co-occurrences were analyzed taking as a reference unit the keywords “Authors’ Word,” “Source’s Words” and “Added Words” (respectively, keywords indicated by the authors, the journal and WoS). The *equivalence index* (Callon *et al.*, 1991) was chosen as the measure of similarity for normalization and *the simple centers algorithm* as the aggregation algorithm to extract the clusters. To derive the relevance of the words, the number of citations and the *H-index* were chosen (Hirsch, 2005; Alonso *et al.*, 2009, 2010), taking into account the “Core documents”. Finally, the *Jaccard index* (Peters and Van Raan, 1993) and the inclusion index were used as measures of evolution and overlap of topics, respectively.

The results of the analysis (step 5) based on the output of SciMAT are discussed in the next section.

3. Results

3.1 Descriptive analysis

Starting the descriptive analysis with the number of published journal articles per country, China is the most productive country with 57 publications (equal to 21% of the total), followed by the United States with 52 publications (equal to 19% of the total). Taken together, the two nations account for more than a third of the total contributions published in the period under review. In third place we find Taiwan (with 33 publications), followed by India (with 30 publications) and Great Britain (with 22 publications). The latter is, therefore, in first place among European countries, followed by Germany (with 21 publications).

Table 1 shows the *top ten* of the most cited articles published in the period 2000-2020. This is a particularly useful analysis as it allows us to understand the influence of publications in the scientific community.

The work of Wu and Wang (2005) is the most cited, both for the total of the period (since it is among the contributions published for the longest

time) and as an annual average of citations. Specifically, Wu and Wang (2005) studied the intention to use a mobile channel for purchases through the application of an extended version of the TAM.

The second most cited article, albeit with a significantly lower number of citations, was by Lin and Wang (2006); they developed a model of customer loyalty in the mobile context.

Tab. 1: Citation analysis

Title	Authors	Year of publication	Number of citations 2000-2020	Average annual citations
What drives mobile commerce? An empirical evaluation of the revised technology acceptance model	Wu and Wang	2005	981	61.31
An examination of the determinants of customer loyalty in mobile commerce contexts	Lin and Wang	2006	375	25.00
Design aesthetics leading to m-loyalty in mobile commerce	Cyr <i>et al.</i>	2006	303	20.20
Predicting consumer decisions to adopt mobile commerce: Cross country empirical examination between China and Malaysia	Chong <i>et al.</i>	2012	203	22.56
What drives Malaysian m-commerce adoption? An empirical analysis	Wei <i>et al.</i>	2009	198	16.50
A meta-analysis of mobile commerce adoption and the moderating effect of culture	Zhang <i>et al.</i>	2012	189	21.00
Factors affecting purchase intention on mobile shopping websites	Lu and Up	2009	179	14.92
Increasing trust in mobile commerce through design aesthetics	Li and Yeh	2010	172	15.64
On the go: how mobile shopping affects customer purchase behavior	Wang <i>et al.</i>	2015	149	24.83
A two-staged SEM-neural network approach for understanding and predicting the determinants of m-commerce adoption	Chong	2013	126	15.75

Source: authors' elaboration

3.2 Evolutionary analysis

Before proceeding with the evolutionary analysis generated by the SciMAT software, a process of de-duplication of keywords was carried out to avoid the presence of duplicates (which can result from the use of plurals, separators and synonyms) and thus improve the quality of the data and the results produced.

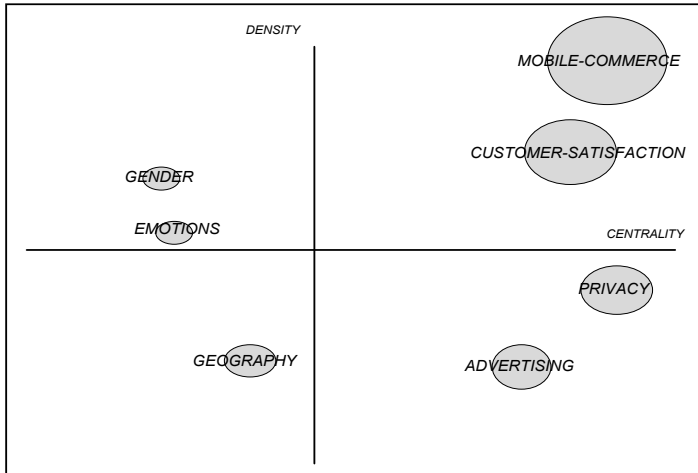
Through the strategic diagrams (Fig. 2 and Fig. 3) it is possible to identify the topics covered in the two periods examined, their weight and their relevance. In particular, within the four quadrants are distinguished:

(1) the central themes - *mother theme* (top right quadrant); (2) the basic and transversal themes - relevant but still poorly developed themes (lower right quadrant); (3) emerging or declining themes (lower left quadrant); and (4) marginal themes (upper left quadrant).

In the first analysis period (2000-2015), seven main themes emerge (Fig. 2).

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Fig. 2: Strategic diagram for the period 2000-2015



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These are the years in which interest in m-commerce began to emerge. For this reason, studies focused on the selection of a mobile channel for the purchase of products and services. The presence in the quadrant of the mother themes of *mobile-commerce* and *customer-satisfaction* keywords confirms this trend.

Analyzing in detail the *mobile-commerce* theme, we find links with the keywords *adoption*, *determinant* and *technology acceptance model*. The main focus of this period is centered on the identification and study of the antecedents of the intention to use a mobile channel in the purchase process. In particular, the concept of intention refers to the first time an individual considers the use of a technology or channel; therefore, it represents the motivational components of an individual's behavior, a measure of the strength of their intention to perform a specific behavior and the degree of conscious effort exerted to perform it, namely to make future purchases through the mobile channel (Davis *et al.*, 1989; Fishbein and Ajzen, 1975). The theory most used for this purpose was the TAM, which was developed by Davis (1989) to study the adoption of new technologies. Wu and Wang (2005) proposed an extended version of TAM. In addition to adding new variables, Wu and Wang (2005) demonstrated the negative action of the perceived cost related to the use of m-commerce (equipment costs, access costs and transaction fees) and the positive action of compatibility (perception of a consistency between a purchase via a mobile and one's values, experiences and needs) on purchase intention through a mobile

channel. Shih and Chen (2013) in turn expanded the TAM through the integration of the *Task-Technology Fit* model and demonstrated the greater explanatory strength of this integrated model compared to the two individual models. The use of TAM to explain the intention to use mobile devices to make purchases has continued over the years focusing on specific countries (e.g., China, Sun *et al.*, 2010; Singapore, Yang *et al.*, 2015; India, Goyal *et al.*, 2013) and cross-cultural comparison (e.g., Chong *et al.*, 2012; Dai and Palvi, 2009).

The second mother theme of the period is *customer-satisfaction*, which is strongly related to the issues of *loyalty* and *continuance intention*. Researchers' attention, in this case, was no longer directed to the determinants of the selection of a mobile channel, but to customer satisfaction following the use of the channel itself; satisfaction that turns out to be decisive in the decision to continue to use the mobile channel. Satisfaction is defined as a psychological or emotional state resulting from a cognitive assessment of the gap between expectations and actual performance following an experience with a product or service (Anderson and Srinivasan, 2003; Falk *et al.*, 2007; Oliver, 1981). In this context, satisfaction refers to the emotional response that follows an m-commerce experience (Agrebi and Jallais, 2015; Groß, 2018; Yang and Lee, 2016). Numerous studies showed that the more satisfied consumers are, the greater their confidence in the channel and the likelihood of continuing to use m-commerce in the future (Bhattacharjee, 2001; Chen and Demirci, 2019; Rodríguez-Torrico *et al.*, 2019).

TAM was also used in studies of customer loyalty to m-commerce; Cyr *et al.* (2006) expanded the model by adding the hedonic component of fun, already used to study purchasing behavior in the online context but never with reference to the mobile context. The results provided by Cyr *et al.* (2006) demonstrated the direct and positive influence of fun on fidelity and the importance of the aesthetic component of the mobile interface as an indirect determinant of loyalty.

Lin and Wang (2006) developed a customer loyalty model and noted the positive influence of the degree of satisfaction on customer loyalty; both variables are in turn positively determined by trust in the *m-vendor*. Choi *et al.* (2008) studied the factors that determine customer satisfaction and loyalty by comparing the context of m-commerce with that of e-commerce. They noted a partial similarity between the factors determining satisfaction and loyalty for the two channels but, at the same time, they also identified unique factors with respect to the contexts. For example, the reliability of the content and the purchase process were determining factors for m-commerce.

Continuing the analysis of the various phases within the customer journey, Zhou (2011) focused on the post-adoption phase, in which the consumer must choose whether to continue and, therefore, reuse the channel for subsequent purchases, recommend the channel or whether to complain about a negative event. The confirmation of expectations, the perceived ease of use and usefulness, and the cost of use are determining factors of satisfaction which, in turn, increase the likelihood that the customer will use the channel again (*continuance intention*) for future

purchases. Continued intention concerns, therefore, the intention of customers to continue using m-commerce services after a first initial use (Andrews and Bianchi, 2013; Chang and Chou, 2011; Rodríguez-Torrico *et al.*, 2019). Gao *et al.* (2015) studied continuance intention: in addition to the degree of satisfaction and trust, they also identified as a significant driver what is called “flow” or a temporary experience in which the consumer is amused and fully focused on the event.

Already in the first period of analysis of m-commerce an interest emerges not only in the first phase of the purchase process, namely that of an approach to the channel and intention to use (relevant since it is a new channel that a user is unlikely to have experienced before), as well as toward its determinants, but also toward the subsequent phases that make up the customer journey (*satisfaction, continuance intention, loyalty*).

Moving the analysis to the second quadrant of the strategic diagram (Fig. 2), the one containing the relevant but still poorly developed themes in the period under review, we find the keywords *privacy and security* and *advertising*. Privacy and security are relevant and sensitive issues that are beginning to emerge in this timeframe. Foresight and confidentiality in the sharing of personal data can, in fact, represent a deterrent to the use of a mobile channel, especially when the advantage gained is marginal.

Benou *et al.* (2012) assessed the benefits and risks of using additional information elements to provide more services to consumers: while the request for more information allows a company to provide superior and personalized services, it also generates concerns in the user regarding the guarantee of privacy and security.

Banerjee and Dholakia (2013) pointed out that the increasing diffusion of the wireless network has eliminated one of the barriers to the use of mobiles as a purchase channel, namely, connection costs. They identified different consumer segments based on mobile shopping behaviors and reported that privacy care was a key variable in this segmentation. Privacy-conscious individuals were more inclined to use mobile devices to make purchases when they were within the walls of their home, in a “protected” context, whereas less privacy-conscious individuals use mobile devices to make purchases anytime and anywhere. Chorppath and Alpcan (2013) studied the motivations that push users to provide data on their location when using mobile apps, allowing companies to offer location-based services. The risks perceived by users and the benefits offered defined the level of granularity of the information they shared about their location. Finally, Lai and Lai (2014) identified users’ concern for their privacy as a deterrent to the use of m-commerce.

In the associative network identified around the keyword *advertising*, we find the terms *mobile marketing* and *involvement*. The effectiveness of mobile advertising is an important tool to increase the intention to m-commerce. In this context, Varnali *et al.* (2012) investigated consumer responses to SMS-based mobile advertising campaigns and, in particular, the effect exerted by the characteristics of the message (incentives offered and prior authorization by the user) and the effects of the consumer’s perception of the message (attitude toward the campaign, involvement, intrusiveness of the message and past experience) on the outcome of the

advertising. The results of their study showed that perceived intrusiveness and attitude have a greater influence on the consumer's reaction to the advertising than incentives and the prior authorization required. Rau *et al.* (2014) studied the relation between the repetition of a message and the level of time pressure with reference to SMS-based mobile advertising campaigns: they reported that if the effectiveness of advertising on mobile devices is greater in a context characterized by low time pressure, then it is desirable to minimize the disturbances caused to users, limiting the daily amount of ads. Finally, Lin and Chen (2015) showed that the credibility of a message acts positively on attitude toward m-commerce (driver of intention), while irritation generated by a message acts negatively.

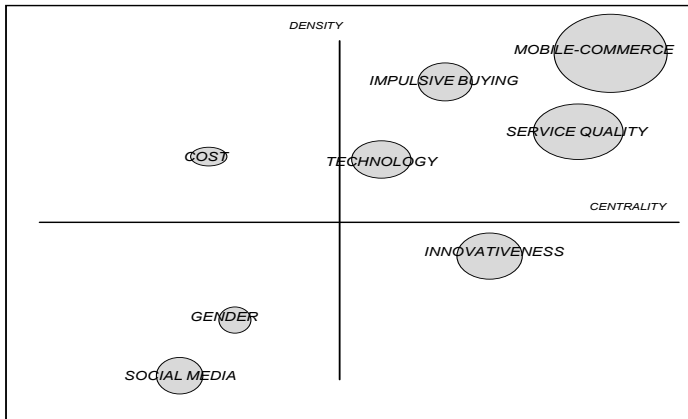
In the third quadrant, which groups the emerging or declining themes, the term *geography* is positioned, which lacks sufficient density and centrality to be able to represent a relevant theme of the period. This term, in reality, does not reflect a line of study in the mobile context but, simply, highlights that several studies were carried out with reference to a specific country, as also emerged during the analysis of other keywords. Therefore, we cannot speak of an emerging theme or a declining theme, but of a mode of analysis transversal to all the themes.

The fourth and last quadrant contains the marginal themes in which we find the keywords gender and *emotion*. Gender refers to studies that investigated possible differences in mobile shopping behaviors between men and women (e.g., Banerjee and Dholakia, 2013; Okazaki and Mendez, 2013; Chung, 2014). Emotion recalls the importance of the emotional component in decision-making processes in the mobile context. M-commerce services are often used by users to have fun experiences and, for this reason, companies that use mobiles as a sales and/or communication channel must try to increase the sense of fun experienced by the user. To do this they must invest in the: (1) content of the message and the service offered; (2) social orientation of the user, since shopping, even if "virtual," is experienced as a moment of sociality (social experience is one of the hedonic reasons for shopping); and (3) self-orientation (another hedonic motivation for shopping), that is, m-commerce services must become an integral part of the user's lifestyle (Davis, 2010). The importance of the hedonic dimension in m-commerce has also been demonstrated by Ono *et al.* (2012) in a study comparing the reasons for choosing a mobile channel over a physical one.

In summary, in the period 2000-2015 the literature in the m-commerce field focused on the identification of the determinants of the choice of channel, on the link between trust, loyalty and customer satisfaction and on to the continuous intention defined as the repeated use of the channel. Finally, over time the hedonic and emotional components linked to purchases also became important even in the digital context.

The strategic diagram for the second analysis period (2016-2020) identifies eight relevant themes (Fig. 3). Although the number of reference years is lower than in the previous period, the topics that emerge from the analysis are numerous and appear to be growing.

Fig. 3: Strategic diagram for period 2016-2020



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Among the mother themes we find, of course, *mobile-commerce*, the topic of our research. The main interest in this period is in user satisfaction derived from the use of m-commerce. In particular, on the one hand, its determinants are studied and, on the other, the role it plays within the customer journey. Marinkovic and Kalinic (2017) identified trust and mobility as the main drivers of satisfaction, but the effect of these drivers is moderated by the personalization of the website (an effective tool to meet users' expectations). From a managerial point of view, they emphasized the advantages offered by m-commerce in terms of mobility, and highlighted the need to communicate more to users the benefits brought by this channel. Mobility is defined as the set of benefits deriving from access to and use of a product/service without space or time limits. Not least is the role of personalization: m-commerce services must be as consistent as possible with the needs, values and lifestyles of users. In the model proposed by Groß (2018), user satisfaction is included as a direct determinant, together with behavioral intention, of the actual behavior achieved, further supporting its importance within the customer journey. Finally, Jimenez *et al.* (2016) reported that satisfaction acts positively on both trust and loyalty to the channel, whereas Thakur (2018) stated that satisfaction is an important determinant of continued intention.

Another central theme of the period is *service-quality*. According to Yang *et al.* (2017), the integration of online and mobile channels by the retailer has a positive effect on the quality perceived by the user with reference to both contexts, which has a positive impact on their overall satisfaction and, consequently, on repurchase intention. Also in the field of multichannels, Moon and Armstrong (2019) developed a model aimed at studying intention to revisit a store in the online-to-offline environment. In particular, they focused on the business model that is developed in order to lead online customers to the physical store: users search for information, order products/services and pay on both the online and mobile channels but collect the product within the physical point of sale. In this particularly

complex context, the perceived quality of service, which acts positively on trust and negatively on perceived risk, is determined by both tangible and intangible factors that affect both environments (physical and virtual). It is, therefore, a construct whose evaluation depends on a multitude of factors associated with the context.

Noteworthy is the attention paid to a new theme in the mobile context: impulsive-buying. Extensively investigated in the physical context and in the online one, impulse buying begins to be studied with reference to m-commerce only in this second time period. This new channel seems, in fact, to increase impulse purchasing behaviors and for this reason it is of interest to identify its determinants. Zheng *et al.* (2019) pursued this goal through the development of a model based on the stimulus-organism-response model. They demonstrated a direct effect of hedonic motivations of mobile navigation on impulsive buying and an indirect effect (moderated by hedonic motivations) of utilitarian motivations. Chen and Yao (2018) also studied impulse buying behavior but with reference to mobile auction platforms. In this context, the tendency to make impulsive purchases, the regulatory assessment of the opportunity to make a purchase and the positive emotion generated by the situation act positively on the realization of an impulse purchase. So, although several studies have shown that the mobile channel has increased this type of behavior, it is equally true that a personal predisposition toward impulsive actions is a relevant driver. To this, of course, is also added the context that can arouse positive feelings that can lead to the development of high expectations.

The last keyword placed in the quadrant of mother themes is *technology*. In particular, reference is made to the impact exerted by the technological evolution of mobile devices on consumer purchasing behavior. The contribution published by Pantano and Priporas (2016) set itself precisely this objective: to understand the extent to which mobile technologies have changed purchasing behavior in the retailing sector. The results demonstrated the importance of the advanced technology and services offered by m-commerce to move consumers toward this channel, both to carry out all the steps of the purchasing process and to integrate it with other existing channels (online and offline). The qualitative research conducted by Fuentes and Svingstedt (2017) highlighted the contribution of smartphones to the redefinition and transformation of consumer buying behavior. Through a mobile phone it is possible to collect, process and share information in a new way, as well as live new shopping experiences. Surely these are positive consequences for the consumer, but they are, however, also accompanied by negative implications, such as greater anxiety and a greater level of stress. This new technological advance pushes more and more users to move from the online channel (which involves the use of personal computers) to the mobile one (which involves the use of mobile devices) to make their purchases. According to Tang *et al.* (2016), the elements that favor this migration, in addition to the perceived usefulness and perceived ease of use of mobile devices (in accordance with TAM), are the perceived security of the channel and some limitations related to the tools connected to e-commerce: the space and time constraints and the size of the personal computer.

In the light of this first examination, it is noted that in this second period of analysis, attention is not only directed to the mobile channel as limitless compared to the other channels, but scholars also began to increase their study of its interaction with other channels, in a multichannel and omnichannel perspective.

Innovativeness is the only cross-cutting theme that emerges from the analysis. Among the drivers of channel choice, greater importance is placed on the innovativeness of the consumer, a trait that is independent of the context. When we talk about innovativeness we refer to an individual's predisposition to search for novelties or to be receptive to new ideas (Goldsmith, 2001). For this reason, those who are more inclined to innovation will be more likely to try new products, new services, new channels and, therefore, are more likely to adopt m-commerce. However, the relationship between innovativeness and intention to use m-commerce is not entirely clear. Chang (2019) demonstrated a direct and positive relationship between innovativeness and trust in mobile technologies and the intention to use m-commerce, whereas Sun and Chi (2018) noted an indirect relationship: innovativeness acts on intention through perceived usefulness and perceived ease of use.

In the quadrant of emerging themes are the keywords *gender* and *social media*. Gender is a variable increasingly frequently inserted in models of analysis of mobile consumer behavior as a driver of behavior or as a moderator of some relationships. In the tourist context, Tan and Ooi (2018) supported the hypothesis of such moderation on the relationship between trust and behavioral intention. However, Marinković *et al.* (2020) noted a different attitude toward the channel between men and women. In general, the role played by socio-demographic characteristics gathers the interest of the research community because it is important, also for managerial purposes, to understand how these act on individuals' selection of a channel.

The theme of social media and social m-commerce is the real emerging theme of the period that is given ample space for in-depth study in the literature. Hew *et al.* (2016) proposed a model to study the impact of mobile social commerce on brand loyalty and demonstrated that social media users are actually inseparable from their use of social media, which have become an integral part of their daily lives, and not even the concern for the privacy of one's information seems to be able to prevent their use. According to Hew *et al.* (2019), being a mobile social media user increases the likelihood that the individual will use mobile social commerce; barriers to use seem to be disappearing. In contrast to most of the literature that claims that social media is a very important tool for retailing, Parker and Wang (2016) reported that consumers actually prefer to communicate with others in a more traditional interpersonal way rather than publicly share their shopping experience on social media.

Costs is the only keyword to occupy the quadrant of marginal issues; it comprises all the studies that investigated the impact of transaction costs on the use of a mobile channel (e.g., Tang *et al.*, 2016; Luo *et al.*, 2020). Although there are recent studies that investigated and analyzed this issue, it is actually a topic that is no longer particularly current, since the use of

m-commerce has now become an increasingly widespread practice and, consequently, users no longer consider transaction costs to be important.

4. Conclusions

The present work has pursued the goal of providing a systematization of research contributions on the topic of m-commerce in light of its growing relevance in the global economic scenario, further accelerated by the health emergency situation caused by COVID-19. The results of the bibliometric analysis conducted on the research contributions of the last 20 years provide a clear picture of what the future directions of research should be and the areas on which companies will have to focus in their development of omnichannel business models.

First of all, it seems necessary to observe that the topic of m-commerce has not lost its centrality over the decades. The unaltered positioning of mother themes in both strategic diagrams underlines that the topic continues to be researched, in order to produce useful knowledge for operators already present in the digital market and for companies that are reviewing their business models from a multichannel perspective and as a response to the emergency context.

Over the last 20 years, with the evolution of technology and the consequent greater familiarity of users with technology, the attention of scholars has shifted from the antecedents of the intention to adopt mobile as a purchase channel to the reasons for the repeated use of the mobile channel. The result is a rather exhaustive cognitive framework that seems useful to guide the strategies of all operators, regardless of in which phase of the life cycle of m-commerce adoption they are.

Newcomers to m-commerce can draw on the wide wealth of research contributions on purchase intention, and find out the factors, mainly of a utilitarian nature, that reduce barriers to the use of the mobile channel. Companies that have been operating in the digital market for longer, can benefit from the latest knowledge on the antecedents of continuance intention and on the determinants of satisfaction, loyalty and trust. It is certainly very interesting to learn that these aspects are affected by the hedonistic dimension and the aesthetic component of the mobile interface, in addition to factors of convenience, such as ease of use and perceived usefulness. The utilitarian dimension and the emotional dimension, therefore, intertwine creating the necessary and sufficient conditions to increase consumer satisfaction, which ultimately increases the likelihood that the consumer will continue to use m-commerce for future purchases.

It is precisely on these issues that research in recent years has focused. The key to the success of m-commerce increasingly lies in its ability to meet consumer needs throughout the customer journey through different physical and digital touchpoints. Empirical evidence on the relationship between channel integration, perceived quality and satisfaction progressively shifts the attention of scholars from the mobile channel alone to its interaction with other channels, in a multichannel and omnichannel perspective.

In this context, the importance of a key feature of the mobile channel stands out, which is mobility. Mobility (i.e., the set of benefits deriving from access to and use of a product/service without space and time limits) represents, in fact, an important driver of satisfaction because it offers a unique advantage to the consumer. It can therefore be concluded that the key to success for companies that intend to implement m-commerce strategies seems to be increasingly linked to the ability to meet the needs of the consumer throughout the customer journey in a multichannel and omnichannel perspective.

Thus, it is reasonable to expect further growth in research contributions to investigate the multichannel behaviors of consumers and the roles they attribute to different touchpoints within the customer journey.

To this the interest of companies in the phenomenon of impulse buying is certainly added, widely investigated in the physical context but for which there still seems to be room for in-depth analysis in the digital context, in general, and in the mobile one, in particular. The mobile channel seems, in fact, to increase impulse purchases and therefore the attention of companies should focus on the determinants of this specific behavior in the mobile scenario.

In this context, the understanding of consumer behavior becomes more complex because new variables and their relationships come into play from which new ways of interaction and purchase arise. The study of the hedonistic and utilitarian components in the use of the different touchpoints, as well as the factors and methods of interaction that more than others can determine impulse purchases, seem relevant, without neglecting the role played in this context by the app and social media as important channels of interaction and purchase. It is in this scenario that the real emerging theme of the coming years, which companies will have to learn to confront, appears: mobile social commerce. In particular, companies will necessarily have to consider that social media users are actually inseparable from their social media, which have become an integral part of their daily lives, and there seem to be no privacy and security barriers to social media use.

Therefore, the topic of m-commerce from the consumer behavior perspective is enriched with new content, fueling research and managerial interest in the emerging themes of social m-commerce, without neglecting the dimensions of service quality that in the omnichannel scenario become even more articulated.

The availability of the Internet anytime and anywhere, the sharing of experiences, and the virtuality that increases interactions with the customer must necessarily stimulate companies to consider mobile devices at the center of their growth strategy. The future, in fact, still holds new mobile shopping experiences. For example, quality and increasingly realistic content enabled by virtual reality technologies, artificial intelligence, digital voice assistants and smart speakers will influence the next trends in the m-commerce world.

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How does eco-innovation affect sustainable business model change? Case studies on green energy projects¹

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Abstract

Purpose of the paper: The study analyzes how eco-innovations implemented by companies may change sustainable business models by affecting their economic performance.

Methodology: The paper is based on a case study of Enel, a multinational utility sector company, and refers to three innovative green energy projects.

Results: The analysis shows that the adoption of eco-innovative projects in sustainable energy affects sustainable business models. The main changes are related to customer sensing, value proposition, and the business model's value chain and linkages components. The new value proposition usually consists of the green and sustainable value offered through the eco-innovation projects that determine novelties in the sustainable value proposed by the company. Innovations that affect the business model's value chain and linkages components are mainly related to new relationships with partners and new competencies developed within Enel.

Research limits: The cases refer to just one company.

Practical implications: The study provides useful insights for companies and practitioners to understand whether and how the adoption of eco-innovation by companies changes their sustainable business models and how such aspects may affect the economic performance of companies.

The originality of the paper: This paper clarifies the relationships between innovative green projects and sustainable business model innovation by considering the different business models' dimensions, which allows for a detailed analysis of their components. At the same time, the paper explores the effects of sustainable business model innovation on the company's performance.

Key words: sustainable business model; business model change; eco-innovation; green energy projects

1. Introduction

Eco-innovations are defined as the 'introduction of any new or significantly improved product (good or service), process, organizational

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change or marketing solution that reduces the use of natural resources and decreases the release of harmful substances across the whole-life cycle (Eco-Innovation Observatory, 2011).

Extensive empirical evidence shows that eco-innovation improves a firm's environmental performance (Costantini *et al.*, 2017; Singh *et al.*, 2020). One of the most critical issues is the limited diffusion or adoption of eco-innovation by companies. Companies are unsure as to exactly how eco-innovation adoption may also increase their economic performance (Ch'ng *et al.*, 2021).

This paper explores the effects of adopting eco-innovations on business model innovation (hereafter BMI). The aim is to understand whether and how eco-innovation implementation positively impacts business performance. Although the literature on traditional innovation has identified multiple constraints to BMI, yet studies on BMI affected by the adoption of eco-innovation are quite limited.

We investigated the phases in which eco-innovation projects are adopted by firms; particularly how and why changing the BM can help firms to accommodate the challenges of eco-innovation adoption and, in turn, to improve their economic performance. We investigated three business cases regarding a more sustainable use of energy related to Enel Group, a company in the energy utility sector.

2. Theoretical background

2.1 Business model and business model change

BM comprises customer sensing, customer engagement, value delivery, and monetization. These components reveal the causal links between value creation and value capture at a company level (Baden-Fuller and Mangematin, 2013; Zott *et al.*, 2011). The BM is a tool that analyses and describes how firms operate and suggests how they could innovate and increase their performance at a business level (Teece, 2010).

The concept of BMI is very popular in the literature. BMI is a process that changes the central elements of an organization and its business logic (Bucherer *et al.*, 2012). BMI, also defined as BM change, entails modifying the firm's activity systems (Shakeel *et al.*, 2020). Given that companies, are continuously adapting, changing, redefining their strategies and actions that affect their traditional BMs (Geissdoerfer *et al.*, 2018), BMI may lead to radical or incremental modifications of existing BMs to adapt to change and innovation. When adopting new technologies or ideas, it is not easy for companies to change their BMs (Chesbrough, 2007), and uncertainty linked to multiple aspects plays a key role. Studies on BMI linked to traditional innovation (i.e., not eco-innovation) identified some constraints or barriers linked to the changes in existing BMs; for example, managerial cognitive bias plays a key role in preventing BMI in new technologies or adopting new ideas (Chesbrough, 2010; Tripsas and Gavetti, 2000).

This study contributes to the literature on BMI related to a specific typology of technologies or ideas known as eco-innovation. Eco-innovation

could address some environmental and social needs for all society. This study aims to understand, as in the case of traditional innovations, the effects on BMI that may arise due to the adoption of eco-innovation and any limits or constraints to changing BM components. Specifically, we explore how different BM components have been redesigned or how novel BMs take form when companies implement new eco-innovation.

Moreover, as in sustainable business, uncertainty linked to the return of investments in green innovations is more significant than in traditional innovation (Gauthier and Wooldridge, 2012; Ozaki, 2011). This paper aims to adopt a BM perspective to understand whether and how BM change affected by the adoption of eco-innovation can positively influence the economic performance at the business level.

2.2 Business model for sustainability

There is a recent and growing literature on BMs for sustainability (De Giacomo and Bleischwitz, 2020), some of which have focused on BMI in terms of environmental sustainability (e.g., Sun *et al.*, 2021; Ferlito and Faraci, 2022). Others have explored the effects of BMI on organizational sustainability (Carayannis *et al.*, 2015; Pedersen *et al.*, 2018), for example focusing on ways firms introduce BM change (Brennan and Tennant, 2018; Rajala *et al.*, 2016). Other scholars dealt with BMI for sustainability shift (e.g., Long *et al.*, 2018; Schaltegger *et al.*, 2016); with the attention of factors determining the changes (Ritala *et al.*, 2018).

Multiple dimensions of BM (Baden-Fuller and Mangematin, 2013) can be changed due to eco-innovation, such as customer sensing, customer engagement, value delivery, and monetization. Our paper aims to advance knowledge on BM for sustainability by exploring how introducing a new eco-innovation affects all the key multiple BM dimensions recognized by the mainstream literature. In this sense, this study offers a comprehensive analysis of all the relevant BM components that may be changed after adopting green energy projects.

The *customer sensing* component of a BM is related to identifying targeted users and customer groups (Baden-Fuller and Mangematin, 2013). This component identifies whether users pay for the eco-services and goods offered by the companies or whether other customers pay. Customer sensing also refers to sustainable needs, and requests from the customers/market.

Customer engagement, also known as the customer value, identifies the value proposition from a customer perspective. Value proposition refers to the embedded value in sustainable products and services. This component comprises eco-innovative offers.

The *chain and linkages* concern value delivery and include all the company's means to deliver and offer its sustainable products and services to customers (Amit and Zott, 2001; Casadesus-Masanell and Ricart, 2010). This component aims to clarify how interrelationships with suppliers and other partners are managed.

Monetization identifies how organizations exploit the value they create. This dimension is a key part of the value capture. It refers to aspects related

to timings and methods of payments and collecting revenues. It includes how revenues are gathered and costs are produced.

3. Methods and data

To understand how adopting eco-innovation positively impacts a firm's economic performance we explored the effects of various eco-innovation projects adoption on the BM's components of Enel, a multinational company in the energy utility sector. Enel is very active in environmental sustainability and renewable energy.

Specifically, we carried out a case study on different business units that adopted three different eco-innovation projects. The three cases focused on innovative projects in sustainable energy to reveal how changing the BM affects the economic returns of eco-innovation for the company.

The empirical part of the study was based on an inductive case-study method. This form of empirical inquiry is particularly suited for investigating processual issues and revealing new theoretical relationships (Yin, 2009). We executed a case study research design of multiple eco-innovation adoption processes. We adopted a purposive sampling strategy (Patton, 1990), consisting of selecting cases based on observable features that affect the relationship/problem/outcome under investigation.

Specifically, eco-innovation episodes were chosen to get variance regarding BM dynamics by following a multi-stage screening procedure (Su *et al.*, 2014). First, we approached several business units of Enel to see if they would participate in the study. Second, we selected different kinds of eco-innovation projects for three cases. In fact the projects had already finished and qualitative data were already available.

Interviews were carried out with managers at different levels of the organization that had been involved under different capacities in implementing the eco-innovations. This helped us to get the most accurate and rich representation of the process under investigation. Specifically, semi-structured interviews, made through phone and web calls and face-to-face, were carried out between July to December 2019. The authors designed an interview protocol to investigate whether and how each eco-innovative project had changed the company's BM. Questions were included with reference to each of the investigated four BM dimensions.

Before the interviews, the protocol was tested through some pilot interviews (Bowles *et al.*, 2019) with respondents who were not part of the organization. These pilot interviews verified the level of comprehension of the questions and helped us to methodologically define the protocol (Bruning and Campion, 2018).

Each interview lasted between 30 and 60 minutes. The interviews were recorded and transcribed to analyze in depth their content. In addition, the interviews were triangulated by collecting and analyzing data from multiple sources in order to increase the quality of empirical inference and triangulate/cross-check primary and secondary source data.

Archival data were collected (Yin, 2009) for the three cases, including minutes of meetings, emails dealing with decision-making processes

affecting BMs and their components, annual reports, financial reports, other internal documents and reports, and press releases. These kinds of data concerned multiple aspects linked to the eco-innovative projects of the company and revealed the main aspects related to the BM changes.

The data analysis, based on transcriptions of the interviews and the other collected information from multiple documents, highlighted the main dimensions of the BMs affected by the adoption of eco-innovative projects. Specifically, the four components identified by extant literature as being the principal dimensions of a BM were considered: customer sensing, customer engagement, value delivery, and monetization (Baden-Fuller and Mangematin, 2013; Aversa *et al.*, 2015).

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4. Results

The effects and changes on the BM's components are described for each eco-innovative case. The impacts of the BM change are then discussed with reference to Enel's economic performance.

4.1 Eco-innovation Project 1 - Geothermal Gas Abatement System

4.1.1 Customer sensing

Geothermal resources generate clean and renewable energy. The electricity produced based on geothermal resources is more environmentally favorable than traditional energy based on the combustion of fossil fuels. However, geothermal energy production involves gas emissions (Padilla, 2007).

The relationship between geothermal plants and the conservation of some key resources of the local areas where plants are located, for example, tourism or agriculture, is a central aspect of the level of sustainability of geothermal energy. Good geothermal development is thus strictly based on the acceptability of local communities (Baldacci *et al.*, 2005). To maintain the environmental quality of the areas where communities live, power plants need to be integrated into the landscape, gas emissions and cooling tower drift need to be reduced and noise minimized.

Geothermal plants in Italy are mainly in small areas, with a strong historical and cultural heritage, a beautiful natural environment, and tourism. The main issue of geothermal plants is air emissions of hydrogen sulfide and mercury. There was a need to address the environmental impacts generated from the plants, especially in the local areas. These needs led to the eco-innovation implementation by the company.

With regard to our case studies, given that power plants in Italy have specific characteristics, as they are usually small and unattended with a high content of non-condensable gases, the abatement technologies available on the market were not applicable and implied high costs. Enel thus developed an eco-innovative process to reduce emissions of geothermal plants. Specifically, the firm patented a new eco-innovative technology for the reduction of atmospheric pollutants from geothermal plants.

4.1.2 Customer engagement

Enel developed and patented an eco-innovative technology to reduce hydrogen sulfide and mercury emissions, which was based on the characteristics of geothermal power plants in Italy (Sabatelli *et al.*, 2009). Hydrogen sulfide causes bad smells in the areas where geothermal plants are located. The newly developed eco-innovation enabled a more sustainable and green process as it does not use chemicals and does not generate sulfur-based by-products to be disposed of or recycled (Baldacci *et al.*, 2005).

The other main issues of geothermal plants are the drift from wet cooling towers (salts, boric acid), noise from the machinery and cooling towers, and the visual impact of the plants on the landscape. Before the implementation of the eco-innovation, Enel did some preliminary technical studies. Laboratory tests on mercury sorbents and catalysts for hydrogen sulfide oxidation were then carried out, and a pilot plant using a side stream of a geothermal power plant was then used to demonstrate the feasibility of the process.

The patented eco-innovative technology is based on three main phases:

1. Removal of mercury through chemical absorption
2. Selective catalytic oxidation of hydrogen sulfide to sulfur dioxide
3. Sulfur dioxide scrubbing by a side stream of cooling water

4.1.3 Chain and linkages

To develop the eco-innovative technology, the interviewee said “*Enel has developed new contacts with different kinds of partners. For example, Enel worked with suppliers of products or with maintenance or cleaning services companies*”.

Enel, that patented the eco-innovative technology also adopted new internal competencies that did not have before. “*Many training activities have been carried out within Enel*” to support the development of new knowledge required by the project among employees.

The adoption of the new eco-innovation led changes in the Enel company's BM that established “*new relationships with partners, new knowledge, and skills*”, according to the interviewee.

4.1.4 Monetization component

Enel sustained the cost of the investment of the patented eco-technology. Enel had several contracts with multiple partners/suppliers involved in the value offer coming from the eco-technology adoption. Contracts were usually based on periodical payments for ordinary services and specific payments for tailored services offered by partners. Contracts usually had a duration of two years.

The return of investment required a long payback time. Since the first pilot version of the eco-innovation project is dated, and then other plants have been improved with the new technology, “*it has not been easy to quantify the entire direct economic returns of the eco-investment*”, said

Enel. However, there are also some indirect economic effects from the eco-innovation resulting from the company's positive image and reputation gained, and the better environmental performance perceived by the community where plants were located.

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4.1.5 The effect of the eco-innovation project on Enel's performance

The implementation of the eco-innovation led to some changes in Enel's BM that positively affected the company's performance. There was an improvement of the plant efficiencies in terms of mercury removal and H₂S abatement in the NCG (Non-condensable gas) steam, which are over 90% and 99+%, respectively. Multiple benefits generated for satellite activities and for the local communities, thanks to the new sustainable and green value proposition, as eco-innovation has proven to be an effective and reliable abatement technology (Sabatelli *et al.*, 2009). The eco-technology affected the BM by adding new knowledge and competencies likely leading to more efficiency in the company.

Enel's performance has achieved positive effects from the development of the technology; however, they are difficult to quantify.

Firstly, many positive effects were indirect. Moreover, the eco-innovative project was first in just one plant and then in other new plants over a time period that makes it difficult to quantify exactly all the effects generated on the company's performance.

Secondly, other benefits derived from the positive image and reputation that the company gained from the local community. The innovative eco-technology meant that the geothermal plants performed better environmentally (fewer gas emissions and less smell from hydrogen sulfide), thus raising the environmental quality of the areas where the plants were located (Baldacci *et al.*, 2005).

These aspects may also have had an indirect impact on the business performance. Thanks to the innovative technology that they patented, Enel's competitive edge heightened their financial performance.

4.2 Eco-innovation Project 2 - New technologies for the treatment of cooling towers.

4.2.1 Customer sensing

The cooling waters of thermal energy plants need to be controlled to avoid scaling or fouling the system and the condenser. The cooling circuit of the power plant of the case study is composed of a natural-draft cooling tower. Enel set up an eco-innovative pilot project to address some operation and maintenance main issues inside a thermal energy power plant and specifically to improve heat exchange efficiency and reduce the environmental impact of the process, through the:

- Minimization of water consumption
- Minimization of chemical products
- Use of innovative products with low environmental impact
- Protection from scaling and corrosion

- Microbiological protection of the circuit
 - Automation of the treatment and performance monitoring
- Various sustainable needs were behind the eco-innovative project. *“The first is linked to the request to reduce water consumption”*, said Enel. Moreover, *“another aspect is related to some critical issues due to the fouling of the cooling circuit”*. The latter aspect lowered the plant’s performance and efficiency. In addition, another need was the request to reduce the efforts of plant operators.

The eco-innovation consists of a plant installation owned by Enel. For this reason, consumers cannot be directly identified. Citizens have a sustainable benefit, as the eco-innovation allowed minimization of water consumption in the plant and, therefore, the local community have more water availability.

4.2.2 Customer engagement

The pilot phase of eco-innovative project consisted of:

a. Chemical treatment for pH monitoring.

This activity is based on using specific products to control the pH and the microbiological fouling, make a scaling minimization and reduce corrosion, and reduce the addition of chemicals.

b. Management and control system.

This activity enables the management and automation of the treatment and the performance monitoring linked to the applied treatment.

There was the minimization of water consumption since the treatment adopted in the pilot project allowed the system to work at higher concentration cycles in the cooling towers. Specific data on the amount of water consumption were estimated. In terms of minimization of chemical products, *“the eco-innovative project adopted by the company reduces chemical consumption through the automation of the dosage of chemical products and the reduction in make-up water to be treated”*, commented an interviewee.

The eco-innovation project related to the plant represented a significant change in the management of the cooling towers - from a model of a product purchase contract to a service contract.

4.2.3 Chain and linkages

Chain and linkages refers to Enel’s mechanisms to deliver and offer a sustainable and green value proposition. It also enables us to understand whether a network of partners contributes to creating and offering sustainable value. In this case study, for example, suppliers other than Enel may be identified. This component aims to clarify how interrelationships with suppliers and other partners are managed. Specifically, in the case of this eco-innovation, Enel worked alongside an external partner that is a worldwide global leader in water treatment and improvement of the related processes. This partner is a leader in technologies and water and energy services.

Regarding the change in the BM, the eco-innovation allowed some processes to be automatized thereby reducing the workload of those

managing of the thermal energy plant. Some employees thus moved to be dedicated to other operations and maintenance activities within Enel.

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4.2.4 Monetization component

Enel paid a periodical fee for the service and the support offered by the supplier involved in the eco-innovation project (see the previous paragraph for details on the supplier). Moreover, in addition to the periodical fee, another item cost was linked to the purchase of chemical products. There were some fixed and variable costs paid to the supplier involved in the eco-innovation project. The allocation of the costs to be paid by Enel was the following: products (71% of the total costs), costs of the equipment (16%), and the technical assistance provided by the supplier company (13%).

The supply of all services and products was provided within one month from the signature of the contract, based on a monthly invoice that had to be paid within 60 days. The delivery of chemicals and other tools was provided after 15 and 30 days from the order date.

Regarding users of this project, consumers and private citizens did not directly pay for this eco-innovative project and offer, but it was Enel that sustained the investment costs. However, the company gained some benefits thanks to a reduction in the costs of the produced energy.

4.2.5 The effect of the eco-innovation project on Enel's performance

Several changes in the BM have been adopted due to the implementation of eco-innovation. As the project was in a pilot phase at the moment of the realization of the case study, we could not assess the exact effects of eco-innovation adoption on Enel's economic performance. However, the case study results highlighted positive estimates of the eco-innovation project on Enel's performance. Indeed, the water and chemicals savings may lead to reductions in costs and may guarantee, at the same time, an improvement in resources management in the plant. For example, Enel has carried out some estimates on the reduction of water consumption equals 510.000 mc/year. Moreover, in terms of environmental benefits, the project expects to minimize thermal pollution on river water. There is likely to be a 40%-45% reduction in chemical products consumption due to the automation and the management of the dosage of the products due to innovative technology. There are thus economic and environmental benefits for the company that implemented the eco-innovation project of the plant and environmental benefits for the citizens and the private community.

A positive impact on the economic performance may also derive from improving the plants' operation and maintenance processes with enhanced condenser cleanness and heat exchange efficiency. Moreover, the automation of some processes allowed the company to dedicate the operators (previously working to the management of the cooling towers) to other high priorities O&M activities in the company. The consequence for Enel is a more efficient use of human and natural resources and cost savings.

4.3 Eco-innovation project 3 - Hybrid solution coupling diesel engines with storage devices to improve power generation efficiency and grid stability.

4.3.1 Customer sensing

The third eco-innovation was designed to reduce the cost of electric energy linked to a plant located on an island in Italy that is not connected to the national electric distribution network. The plant is essential for the security of the electric system.

The island's local community benefited from a more sustainable plant, with noise emissions reduction.

"The primary client of the project can be identified in the national administrative, regulatory authority for the energy networks and the environment", said the interviewee, who has a primary role, at a national level, in guaranteeing the efficiency of public services, as energy, to users and consumers.

4.3.2 Customer engagement

This new eco-innovation aims to develop a storage system through batteries to optimize the production of a power generation plant located on an island.

The growing use of renewable energy and the traditional use of diesel adopted in the plant has determined a partial load of the plant operation. This aspect has led to an increase in costs due to the higher use of fuels and a non-efficient use of the plant. The eco-innovative project managed to overcome some limits of the system described above, through a storage system that increases the efficiency of the plant and the use of renewable energy, by also reducing noise emissions. Volume of renewable energy available cannot be planned due to its natural characteristics. Therefore, the storage system compensates for the fluctuation linked to the production of renewable energy.

In addition, eco-innovation aims to minimize the environmental impact of the generation from fossil fuels and increase the electrification of network services. The main objective of the project, consisting of installing the storage system on the island, is linked to the optimization of the generation system, the minimization of emissions and consumptions, and the guarantee of the continuity of the production service. The outcome is also to expect to increase a more incisive generation from renewable energy (e.g., photovoltaic system) and to optimize the performance of diesel motors and the energy distribution networks, both from the perspective of the environmental impact and of the cost of the produced energy, by generating benefits for the society.

The project involved a shared value creation approach (Porter and Kramer, 2019) by engaging with local companies to work on the plant.

4.3.3 Chain and linkages

Chain and linkages dimension of the BM enables us to appreciate the company's mechanisms to deliver and offer eco-innovation.

Thanks to the project, *“Enel had developed specific and new competencies in terms of the storage area which employees had to learn specifically for the project”*. Before the project, indeed, the storage topic was seen as being interesting and with some potential for Enel, but not as a business line with economic opportunities. *“After the implementation of the eco-innovation project, Enel had developed strong know-how on these novel eco-technologies”*, said the company. Thanks to the project, the company has started to think that the storage area could be a business for the entire company and for multiple energy sites. New working groups in Enel have been set up to explore new business opportunities in this new area. *“A new awareness has been created within the company about the business potential of storage activities”*.

Enel's top management level has been involved in strategic decisional processes aiming to define new areas to apply the storage. Business and functional units have been re-organized to include new competencies, and activities related to storage. The innovation has thus allowed Enel to deeply change the company's BM, as, until that moment, there was not a unit within the company dedicated to storage. Enel has collaborated with several partners for the realization and offer of the eco-innovative project.

4.3.4 Monetization component

Enel has sustained the investment costs of the eco-innovation, but has required to the national administrative, regulatory authority for the energy networks and the environment a reintegration of the expenses on a multiyear basis (n. 15 years). Indeed, a national norm provides that it is possible for organizations having essential plants for the security of the electrical system to ask for a reintegration of the costs sustained for investments carried out in those plants.

4.3.5 The effect of the eco-innovation project on Enel performance

Before the realization of the eco-innovative project, some estimations on the potential benefits were made. For example, the main estimated benefit consisted in more efficient use of diesel generators and thus minimization of the use of fuels, as well as reduced maintenance and an extension of the life cycle of motors, due to an improvement in the performance of diesel motors. After the implementation of the eco-innovation, the company recognized some additional benefits with respect to those originally estimated.

Some results include the minimization of generation costs. The outcome has been an improved efficiency of the electric system of the island. The analysis of the estimated benefits of the project has resulted in a specific amount of fuel savings with consequent costs. These aspects enable us to conclude that the eco-innovation project has been determined some changes in the BM and a positive impact on the company's performance.

Solutions developed and adopted through the eco-innovative project are valuable for small islands and isolated/disconnected small grids that may use batteries to improve service quality with unstable load curves

and high renewable presence. All these aspects, potentially, may generate positive impacts on the economic performance at a company level.

5. Discussion and conclusions

This paper has explored whether and how the implementation of eco-innovation by companies affects their BMI. The study sheds light on the relationships between green projects and sustainable BMI by also considering the company's performance.

Theoretical contribution

The paper contributes to the emerging literature on sustainable BMI (Yang *et al.*, 2017; Sinkovics *et al.*, 2021) and on sustainable BM and performance (Evans *et al.*, 2017) by showing that the adoption of eco-innovation affects various BM components. Eco-innovation aims to respond to specific societal needs in addition to corporate objectives. For example, having a higher quality of the natural environment in local areas is a need that an eco-innovative project may address. Based on our findings, we argue that the top management team will be more prone to change their BM due to the adoption of eco-innovation. This can be explained as when companies adopt technologies or innovations to reply to specific societal needs (as eco-innovations do), the cognitive bias of the top management team identified by a part of the literature on BMI and mainly linked to traditional innovation may be limited and less extended. In other words, the business modeling activity (Baden-Fuller and Morgan 2010) that may determine a BMI can be easier in the case of eco-innovation, which is a kind of innovation aimed to satisfy specific needs. Eco-innovation thus represents a distinctive kind of innovation, technology, or idea as its social purpose is more evident with respect to traditional innovation. This paper shows that when technologies or ideas are clearly connected to social or environmental needs, the changes on BM are easier to implement for the organization with respect to BMI due to traditional innovations.

Managerial implications

The study also provides useful insights for companies and practitioners to understand whether and how the adoption of eco-innovation may change BMs or some of their components and how such aspects may affect the economic performance of companies.

The main BM changes are related to customer sensing, value proposition, and the BM's value chain and linkages components. In our case study, the innovations that affect the BM's value chain and linkage components are mainly related to new relationships and collaborations between Enel and other partners. They are also related to the new knowledge and competencies required by the eco-innovation developed within the company. Companies may take the opportunities offered by the adoption of eco-innovation to improve their competencies and acquire new skills.

The results also suggest that the adoption of eco-innovation and the BMI positively impacts the company's economic performance. Moreover, indirect aspects seem to benefit the company's performance, such as the reputation gained, the positive image that the local community has of the company, and some environmental and competitive advantages that derive from eco-innovation projects.

The cases also showed that it is not always straightforward to establish to what extent the adoption of eco-innovation (and the related BM change) increases the economic performance at a company level. This aspect is particularly evident in more recent eco-innovation projects, where the impacts on the performance only become clear in subsequent years, or older projects where it is not possible to quantify exactly all the economic impacts generated directly from the project.

Understanding how firms may create and offer sustainable and green value by exploiting it may stimulate the adoption of sustainable innovations at a firm level by meeting the main objectives of the green policies at national and European levels. Moreover, through a deeper comprehension of BM's aspects and components, firms may learn to recognize the opportunities they can achieve by adopting green strategies and innovations (De Giacomo and Bleischwitz, 2020).

Some limitations of the study refer to the fact that cases refer to a single company. Future studies could investigate eco-innovative projects of different companies by comparing the effects of their eco-innovation adoption on the BM change and the company's economic performance.

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Impact of COVID-19 on Digital Transformation: An Empirical Analysis of Manufacturing Companies¹

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Abstract

Purpose of the paper: This study explores whether and how the restrictions resulting from COVID-19 crisis have affected digital transformation (DT) measured by the adoption of data-driven decision-making (DDD) and structured management (SM) practices.

Methodology: On the basis of an original survey of 102 manufacturing firms located in Lombardy, we explore the DDD and SM practices before and during the lockdown, which began on 8 March 2020. The factors explaining heterogeneous responses to the crisis, namely, institutional logic, firm size, technological sectors, and family business, are also considered.

Findings: We find that during the lockdown, firms suffered a setback in the use of DDD and SM. However, there is a significant heterogeneity in the response across firms. The factors considered in our study poorly explain this heterogeneity in DDD. Meanwhile, all factors, except institutional logic, effectively explain the differences in SM.

Research limits: This study provides a preliminary and descriptive analysis. Further analysis is needed to better identify causality and co-factors.

Practical implications: DT could be particularly sensitive to crisis, and crisis response varies across different dimensions of DT (i.e. DDD and SM) and types of firms. This implies that a variety of firms may benefit from DT but that DT requires specific managerial attention.

Originality of the study: This study employs an original dataset that sheds new light on how the pandemic has affected DT. It focuses on one of the largest European manufacturing regions which was severely hit by the first wave of the pandemic.

Key words: data-driven decision making; management practices; digital transformation; institutional logics; COVID-19.

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1. Introduction

The widespread adoption and application of digital technologies calls for a significant transformation in the way organisations conduct their activities, undertake decisions, and craft and execute strategies. Scholars refer to this phenomenon as digital transformation (DT), an ‘organizational change triggered and shaped by the widespread diffusion of digital technology’ (Hanelt *et al.* 2021, p. 1187) or ‘a change in how a firm employs digital technologies, to develop a new digital business model that helps to create and appropriate more value for the firm’ (Verhoef *et al.* 2021, p. 889). Scholars have also discussed the impact of DT on performance and the difficulties faced by firms in attaining the potential efficiency gains promised by DT due to the lack of analytical culture and established management practices (Davenport *et al.* 2010).

The extensive and diverse literature on DT lacks a general agreement on what exactly DT is and what it encompasses (Hanelt *et al.* 2021). However, as Hanelt *et al.* (2021) noted, DT is about organisational change for several reasons. Firstly, DT entails a significant increase in the availability and effective use of data, which is enabled by sophisticated tools for data collection and analysis, such as big data analytics, machine learning, social media, mobile technology, and cloud computing. This wide pool of digital technologies allows firms in different industries to change the way decisions are undertaken. DT leads managers to change management practices and the way they make decisions from traditional methods based on intuition and experience to a data-driven decision-making (DDD) approach, which consists of accessing and using data in real time to manage and test alternative hypotheses and measure performance (Davenport *et al.* 2010; Brynjolfsson and McElheran 2016a, 2016b). Secondly, when firms adopt digital technologies, they interact with management practices (Hanelt *et al.* 2021). Some structured management (SM) practices, such as monitoring (i.e. how firms react to production problems) and performance-based compensation and promotion, may not be directly related to data but are associated with DDD (Brynjolfsson and McElheran 2016a, 2016b). Moreover, SM practices, such as performance-based compensation, positively impact firm performance (Trevor *et al.* 2012; Bloom *et al.* 2013) and innovation (Ederer and Manso 2013). Their association with DDD and their impact on innovation make SM practices a key dimension of DT.

However, several factors may affect the adoption and effective implementation of DT and thereby impact the potential performance gains that firms can capture (Aral *et al.* 2012; Brynjolfsson and McAfee 2012; McElheran 2015). Although the potential benefits of DT in ordinary times are widely known, in the face of shocks and crises, firms may find it difficult to incorporate and benefit from new DDD processes and SM practices. Indeed, crises may have an impact on firms’ willingness to invest in innovation and their ability to do so effectively (Archibugi *et al.* 2013a, 2013b; Brem *et al.* 2020). Hence, a crisis may bring about challenges for firms attempting to embrace DT.

The recent accounts about the effects of COVID-19 on the diffusion of digital technologies suggest that this shock has accelerated the adoption of digital collaboration platforms and remote working (McKinsey 2020; Ferrigno and Cucino 2021). Although the use of such digital tools and working practices has channelled many firms into a digitalisation path, it is still unclear whether this shock on digitalisation has urged firms to embrace DT and as to what extent it has spurred a change in DDD and SM. Factors that influence DT during the pandemic, such as firm characteristics, are still not well understood. Therefore, the objectives of this study are as follows: 1) to understand how the restrictions resulting from the COVID-19 crisis have impacted two key dimensions of DT, namely, DDD and SM; 2) to understand whether this impact has been heterogeneous across different firms; and 3) to identify firms' characteristics based on such heterogeneity.

This study aims to address these objectives by analysing a sample of manufacturing firms in the Lombardy region.

2. Theoretical grounding

In the last decades, DT has been at the forefront of firms' innovation efforts, representing an imperative for executives and top management teams engaged in extracting value from (and transforming their business with) new technologies and digital solutions (Fitzgerald *et al.* 2014).

The potential gains triggered by the rise of digital tools have prompted firms to revolutionise their usual way of doing business, urging them to develop novel capabilities and embrace innovative business models to increase value creation and appropriation (Reis *et al.* 2018; Nambisan *et al.* 2019) and investing in high-skill workers accordingly (Balsmeier and Woerter 2019).

These technologies have some distinctive features relative to previous information technologies (IT) as they are more pervasive and transformative (Bharadwaj *et al.* 2013; Verhoef *et al.* 2021). This implies deeper organisational change (Hanelt *et al.* 2021). As observed by several scholars, many difficulties in navigating DT are related to the organisational and managerial changes required to leverage the opportunities of digital technologies. To better understand the implications of DT for strategy and organisational change, Hanelt *et al.* (2021) suggested a multidimensional framework. They mapped the literature on DT into *contextual conditions*, *mechanisms*, and *outcomes*. The two dimensions of DT introduced previously, namely, DDD and SM, fall under *contextual conditions* and *outcomes*.

Firstly, DDD and SM are related to the contextual conditions that trigger DT. DDD refers to material conditions (i.e. data availability and use) whilst SM pertains to organisational determinants (i.e. organisational strategy and legacy). DDD and SM are strictly intertwined. As explained by Hanelt *et al.* (2021, p. 1166), 'when digital technologies enter organizations, they interact with organizational antecedents, particularly organizational and managerial characteristics'. This is especially challenging when firms introduce new technologies that imply significant organisational

investments, such as those in the form of the time and cost involved in workforce training (Davenport 1998; Devadoss and Pan 2007; Kudyba *et al.* 2020). For example, the adoption of a new enterprise system that combines all application software in a single system imposes a change in a company's strategy, organisation, and culture. Because of its integrating nature, a new enterprise system requires the standardisation of data across functions so that employees are trained in the use of software and understand the logic of the system (Devadoss and Pan 2007). The change required to introduce a new technology rests on the current and past history of an organisation (Devadoss and Pan 2007); hence, firms may face different challenges in implementing DT based on their organisational and managerial characteristics. Managerial practices, such as the adoption of measures to prevent productivity problems, are a crucial means to navigate change. Although not necessarily linked to data, these practices have proven to be positively correlated with DDD (Brynjolfsson and McElheran 2016a, 2016b) and firm performance (Bloom *et al.* 2013). Thus, besides DDD, SM preconditions, such as monitoring and people incentives, put firms in a favourable position to embark on DT.

Secondly, DDD also refers to the *outcomes* of DT and, in particular, to a change in the organisational setup (i.e. data-driven processes). In addition, SM can be considered an organisational outcome of DT. Although Hanelt *et al.* (2021) mostly focused on organisational outcomes directly triggered by digital technologies (e.g. more agile structures, data-driven management), SM is not directly related to digital technology. However, the use of digital technologies is associated with the codification of business processes and more structured management (Brynjolfsson and McElheran 2016a, 2016b). Although the direction of this association is difficult to establish, digital technologies can stimulate the adoption of more advanced SM. For example, AI can be used to assess people's performance more accurately (Kretschmer and Khashabi 2020), thereby making the adoption of performance-based compensation and promotion more appealing.

Although DT has unfolded along a linear trajectory for several years, resulting in heavy worldwide investment in digital solutions by firms and in the increasing adoption of a DDD approach and SM, the recent COVID-19 crisis may have significantly challenged firms' efforts to navigate DT. Scholars have investigated the impact of economic crises on firms' innovation initiatives (i.e. 2008-2009 economic and financial crisis, see Archibugi *et al.* 2013a). However, the effects of the COVID-19 pandemic on DT may provide new insights to the management and innovation literature for two reasons. Firstly, COVID-19's pervasive effects have urged firms to act rapidly on information and communications technology (ICT) and distance work. In addition, COVID-19 is different from previous crises; rather than being a recessive crisis triggering a general decrease in demand, it has spurred different effects across the economy, with some sectors being hit by the crisis (e.g. tourism, food service) and with others actually benefitting from it (e.g. e-commerce, pharmaceuticals) (Craven *et al.* 2020).

Secondly, to fully reap the potential benefits of DT, firms must invest in different complementary dimensions, such as DDD, SM, and skills. As

earlier studies suggest, investing in multiple complementary dimensions requires significant amounts of resources and time, which may prove challenging for firms (e.g. Brynjolfsson and Hitt 2000; Giuri *et al.* 2008). Hence, COVID-19 provides us with a natural experiment setting to explore the effects of the challenges in several dimensions of DT on firms.

Extant innovation studies on the impact of crises on firms' willingness and ability to innovate (Archibugi *et al.* 2013a, 2013b; Brem *et al.* 2020) have proposed two contrasting views on the effects of crises on firms' innovation investments. Building on the Schumpeterian idea of 'creative destruction' (Schumpeter 1939), the first view depicts firms' innovation investments following a countercyclical path, increasing during periods of recession. In these periods, a low level of demand leads firms to allocate their resources to research and development (R&D) productivity-enhancing activities rather than to production activities (D'Agostino and Moreno 2018). This argument is based on the assumption that R&D and production activities compete to allocate limited resources (Barlevy 2004).

The second view maintains that innovation investments run in the same direction as business cycles and thus decrease, rather than grow, during periods of recession because of two reasons. Firstly, during recessions, firms experience significant financial constraints; thus, even if more resources can be allocated to R&D than to production activities, the absolute level of resources available for investment in innovation is limited (Aghion *et al.* 2012). Secondly, because of a low level of demand during recessions, firms may not be able to take advantage of their innovation investments in the short term (Fabrizio and Tsolmon 2014). Thus, firms have limited incentives to invest in innovation because the time window to reap the benefits of innovation investments is limited and, in the long run, competitors may challenge the appropriability of innovation (McGahan and Porter 2003; D'Agostino and Moreno 2018).

These considerations lead to the following research question: *To what extent have firms undertaken DT in response to the COVID-19 crisis?*

Firms differ in their resources and capabilities and in the beliefs and values they may pursue (i.e. in the institutional logics they incorporate). Thus, firm heterogeneity should be considered to fully understand innovation ability and crisis response. The strategic management literature has theorised and found persistent within-industry differences across firms in terms of profitability and competitive advantage, which reflect a significant asymmetry in resource and capability endowments (Barney 1991; Rumelt 1991; Teece *et al.* 1997). In addition to resources and capabilities, differences in performance and productivity depend on organisational design and management practices (Englmaier *et al.* 2018). For example, Bloom and Van Reenen (2010) studied the effects of managerial practices (i.e. monitoring, outcomes and goals, incentives, and rewards) on performance and productivity and how they explain a significant portion of the variance between firms. More recently, Brynjolfsson and McElheran (2016a, 2016b) examined the heterogeneity in SM, ICT investment, and DDD across firms.

These differences in resources, capabilities, and managerial practices will likely yield different responses to crises in terms of firms' innovation

efforts. Some firms may decrease their innovation efforts in view of the resource constraints triggered by crises and the inability to promptly reallocate the resources needed to navigate crisis-related challenges. Other firms may be endowed with specific capabilities and resources to run in a countercyclical direction and embrace innovative efforts.

This potential heterogeneity spurs us to explore the following research question: *Which types of firms have undertaken DT in response to the COVID-19 crisis?*

As discussed above, investing contemporaneously in all dimensions of DT may prove to be particularly harsh for some firms and less detrimental to others, thus reflecting the importance of firm-specific characteristics. Aside from the specific endowment of resources and capabilities, such heterogeneity in the effects triggered by the COVID-19 crisis on the different dimensions of DT may be determined by the set of firms' institutional logics, that is, 'the socially constructed, historical patterns of material practices, assumptions, beliefs and rules by which individuals produce and reproduce their material subsistence' (Thornton and Ocasio 2008, p. 101).

Studies have shown that shocks or crises may impact the logics that firms incorporate and the ways these logics come to be instantiated within organisations (e.g. as dominant or peripheral) (Ramus *et al.* 2017). In addition, radical organisational changes, such as those implied by DT, often entail incorporating different logics, some of which may ease DDD and SM dynamics or actually hinder their development. In particular, scientific logic, characterised by the willingness to share knowledge, freedom, and orientation to innovation (Sauermann and Stephan 2013), may be more in line with some DT dimensions and encourage firms to adopt DDD and SM in comparison with market logic, which is centred around hierarchical control and customer focus as means to capture economic returns.

Indeed, firms whose logic is predominantly scientific and only peripherally market-oriented are more likely to maintain or increase their investment in DT notwithstanding a crisis. This is because as shown in the definition provided above, by incorporating scientifically dominant logic, firms' practices, beliefs, and values become centred on innovative and scientific principles, which likely make them more eager to adopt DDD and SM.

This argument motivates us to explore the following research question: *How do institutional logics affect the response to the COVID-19 crisis in terms of DT?*

3. Data and sample

Our study is based on an online survey of a sample of 102 manufacturing firms in the Lombardy region of Italy. The survey was conducted in collaboration with the local trade association Assolombarda between April and May 2021.

Most questions required answers in two different periods - before and during the lockdown, which started on the date of the first urgent

restriction act by the Italian government (DPCM 8 March 2020). Table 1 provides an overview of the firms' size and technological sectors in our sample.

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Tab. 1: Firms in the sample by sectors and size class

	up to 49 employees	50-249 employees	>250 employees	Total	
High-tech	3	1	4	8	8%
Medium-high tech	12	14	15	41	40%
Medium-low tech	12	14	4	30	29%
Low tech	11	12	0	23	23%
Total	38	41	23	102	100%
	37%	40%	23%	100%	

Note: sectors are based on NACE Rev. 2 classification at 2-digits, Eurostat (2018)

Source: Authors' elaboration

The appendix shows the questions used to construct the two main indicators of DT, as discussed in next Section.

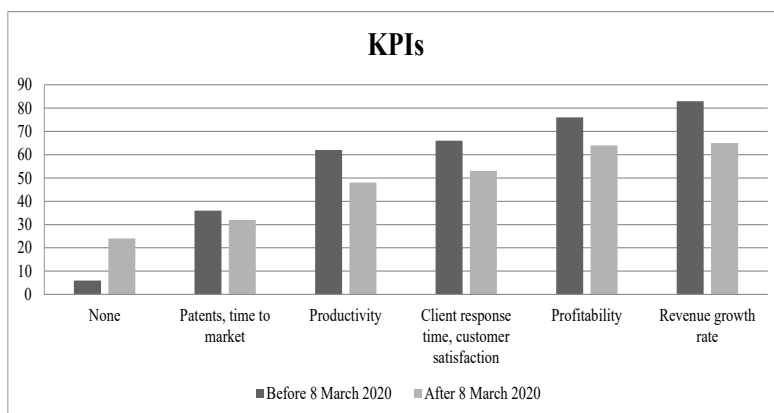
The average share of ICT investments in revenue was 2.28% in 2017-2019, and the forecast for the period of 2020-2022 was 3%. These firms adopted a range of IT applications before the lockdown, and after 8 March 2020, the use of video conference systems increased remarkably and not surprisingly.

4. DT and the pandemic

4.1 Data-Driven Decision Making

We distinguished four pillars of DDD: 1) the use of key performance indicators (KPIs), 2) availability of data, 3) use of data, and 4) short- and long-term targets. The first pillar is the extent to which firms monitor their processes using quantitative measures. A higher number of KPIs suggest a more sophisticated approach to management practices centred on data collection and analysis (Brynjolfsson and McElheran 2016a, 2016b). On average, the sample firms monitored 3.2 KPIs before the lockdown; during the lockdown, the average number dropped to 2.6, with 24 firms selecting none of the KPIs. Fig. 1 shows the number of firms that monitored each KPI before and during the lockdown. Firm growth was the KPI used by most firms before and during the lockdown (i.e. 83 and 65 of the sample firms, respectively); however, it was also the KPI that was most frequently abandoned afterwards: 18 respondents failed to consider growth as a relevant KPI during the lockdown. KPIs related to product innovation (such as the annual number of patents and time to market), chosen by 36 firms in the first period and 32 firms in the second period, were the KPIs that lost the least during the lockdown probably because they are long-term indicators.

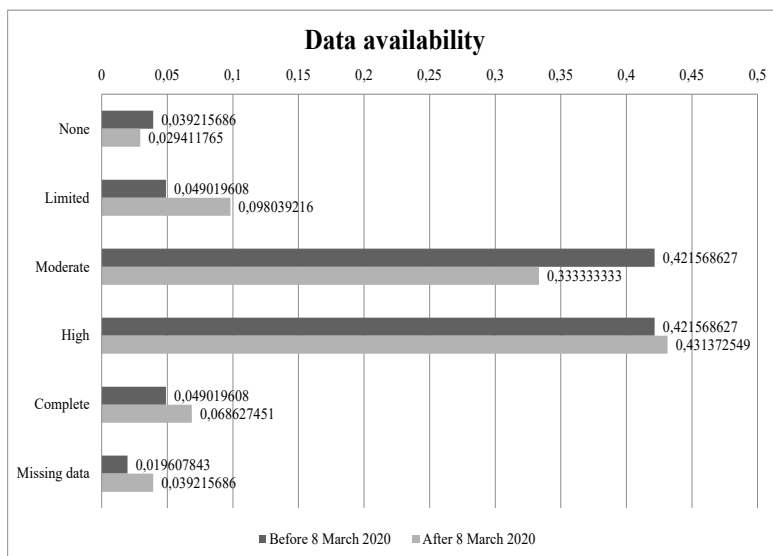
Fig. 1: KPIs monitored by firms



Source: Authors' elaboration

The second pillar of DDD is the availability of data (from none = 1 to complete availability = 5). As Fig. 2 shows, most firms (84%) had moderate or high availability of data in the first period. During the lockdown, this percentage dropped to 76% whilst one of the lowest categories (limited) and the highest category (complete) increased their percentages. Therefore, the lockdown appeared to have reduced the responses at the bottom of the data availability distribution (the sum of moderate, limited, and non-use dropped from 51% to 46%) and increased the responses at the top of the data availability distribution (the sum of high and complete increased from 47% to 50%).

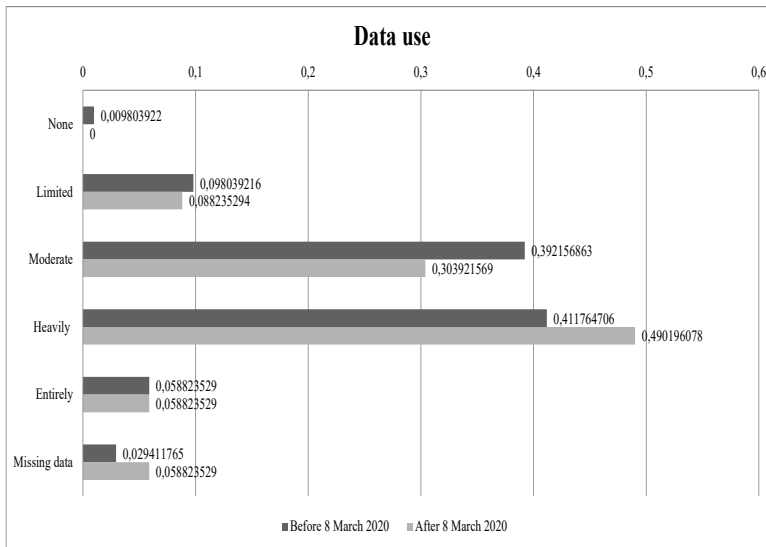
Fig. 2: Availability of data



Source: Authors' elaboration

The third pillar is the use of data (from not used = 1 to highly used = 5). Most firms (80%) reported moderate or heavy use of data for decision making before the lockdown. During the lockdown, this percentage remained stable (79%); there were 6 missing observations, and no firm declared that they had not used data for decision making. Fig. 3 shows that in the second period, a larger proportion of firms used data heavily or entirely (from 47% to 55%) whilst a smaller proportion of firms reported the non-, limited, or moderate use of data (from 50% to 39%)². Therefore, the intensity of data use during the pandemic appeared to have increased in general.

Fig. 3: Use of data



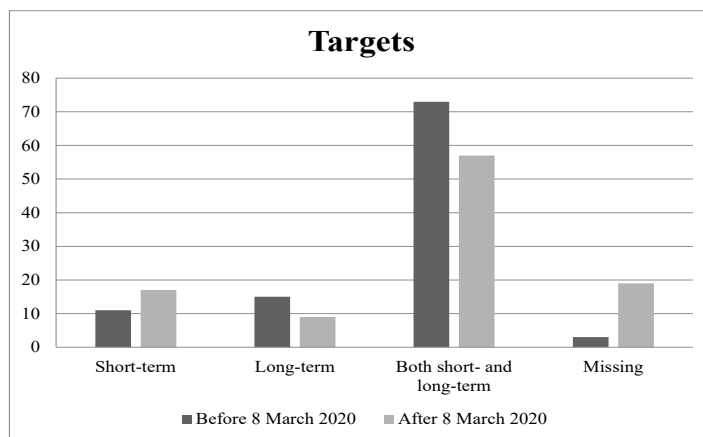
Source: Authors' elaboration

The fourth pillar of DDD is the use of short- and long-term targets (Drucker 1954; Gibson and Tesone 2001; Hertel *et al.* 2005). Targets help managers assess the performance of organisational processes, identify the sources of problems, and take appropriate actions (Brynjolfsson and McElheran 2016b). We measured the importance of management by objectives in a DDD setting by examining the use of short-term, long-term, or a combination of short-term and long-term targets.

Fig. 4 shows that most firms used a combination of short- and long-term targets in both periods. However, fewer firms used long-term and combined targets during the second period. It is interesting to note the increased numbers of short-term targets and missing answers (mostly from firms that used a combined approach before the lockdown), which reflect the difficulty in setting clear, long-term goals under conditions of high uncertainty and tight financial constraints.

² It is worth noting that the use of data refers to available data. For example, it is possible that a firm makes a heavy use of moderately available data.

Fig. 4: Type of targets



Source: Authors' elaboration

We used the four pillars discussed above to build an indicator for DDD. Table 2 shows the number of firms that reached the relevant thresholds for each of the four pillars. Building on Brynjolfsson and McElheran (2016a, 2016b), we selected the top categories of each pillar that signal a strong firm commitment to the DDD approach: (a) at least four out of five KPIs monitored, (b) high or complete data availability, (c) heavy or complete use of available data, and (d) a combination of short- and long-term targets. Whilst the availability and use of data increased during the lockdown, the number of KPIs and combined use of targets decreased. The bottom row in Table 2 shows the number of firms that are at the forefront of DDD and satisfy the four conditions above. Thus, DDD is a binary variable that takes the value of 1 if a firm selects at least four KPIs, the top categories for availability and use of data, and combined targets.

In the first period, 19 firms were heavily committed to DDD (18.6% of the sample); this number dropped to 10 in the second period (9.8%). This declining trend is driven by the KPIs and combined targets.

Tab. 2: Indicator of data-driven decision making (DDD)

Data-related management practices	Before 8 March 2020		After 8 March 2020		Diff.
	# (missing)	% ^a	# (missing)	% ^a	
At least 4 KPIs monitored	48 (6)	47.1%	39 (24)	38.2%	-9
Top 2 categories for "availability of data"	48 (2)	47.1%	51 (4)	50.0%	3
Top 2 categories for "use of data"	48 (3)	47.1%	56 (8)	54.9%	8
Short-term and long-term targets (combined)	73 (3)	71.6%	57 (19)	55.9%	-16
Data-driven decision making (DDD)	19	18.6%	10	9.8%	-9

^a Shares are computed on whole sample

Source: Authors' elaboration

In addition to the DDD approach, other management practices that are unrelated to the use of data comprise DT, and one such practice is SM. In this study, we considered how firms deal with productivity problems and the criteria for assigning performance bonuses and promotions.

To analyse the approach to problem solving, we asked how each firm typically addresses productivity problems, such as late or inadequate responses to customer requirements. The answers ranged from 1 (no action is taken) to 4 (actions are taken to prevent the problem from happening again, and a process to anticipate similar problems is activated)³. The average answer was similar in the two periods: 3.6 and 3.7. However, 24 firms failed to respond in the second period. Moreover, 70% of the firms in the first period adopted the most advanced approach; however, in the second period, 18 of these firms left the box blank. This suggests that the lockdown prevented firms from dedicating enough resources to maintain a sophisticated approach to solving productivity problems.

We also considered performance bonuses and promotion criteria for top managers, middle managers, and employees. Approximately two-thirds of the firms declared that they assign performance bonuses. In the first period, company-level performance bonuses were the most frequently used incentive (40%), followed by individual-level bonuses (33%). Bonuses at the team (16%) or office/department (10%) level were less frequent. The frequency of individual- and company-level bonuses declined during the lockdown whilst the frequency of team and office/department bonuses did not change between the two periods.

The individual-, company-, team- and office/department-level promotion criteria provided a less clear picture because of many missing values (i.e. 32% and 10% of responses, respectively) before the lockdown; the missing values further increased in the second period (40% and 21%, respectively). This result reflects the difficulty of focusing on promotion policies during the crisis. Performance and ability were the most frequently used criteria in our sample for the top managers (52%) and other employees (68%) before and after the lockdown (46% and 59%, respectively)⁴.

Table 3 shows the frequency of use of the most advanced approach to solving productivity problems, bonuses based on individual or team performance, and promotion criteria based mainly on individual performance and ability. The bottom row shows the composite indicator of SM. SM is a binary variable equal to 1 if all three conditions in the rows above apply. We found that 30 companies fell into this category before the lockdown and that only 21 firms met the three conditions during the lockdown. This result confirms that SM was losing ground during the pandemic.

³ Category 2 is 'The problem is fixed, but the firm does not take further action', and category 3 is 'The problem is fixed, and we took actions to make sure that it did not happen again'.

⁴ The residual categories are 'Performance and ability along with other factors such as tenure' and 'Mainly other factors such as tenure'.

Tab. 3: Indicator of structured management practices (SM)

Structured management practices	Before 8 March 2020		After 8 March 2020	
	# (missing)	% ^a	# (missing)	% ^a
Top category for the solution of productivity problems (4)	72 (1)	70.6	58 (24)	56.9
Performance bonuses at the individual or team level	50 (28)	49	44 (28)	43.1
Promotion criteria based on performance and ability only	74 (8)	72.5	65 (18)	63.7
Structured management practices (SM) indicator	30	29.4	21	20.6

^a Shares are computed on whole sample

Source: Authors' elaboration

5. Differences in DT related to firm- and sector-specific factors

In general, the pandemic has forced firms to reduce their commitment to more advanced management practices related to DT. At the same time, we observe significant heterogeneity in the response to lockdown across firms, which may reflect firm- and sector-specific characteristics. In this section, we correlate these characteristics with DT.

We compare the frequencies of DDD and SM firms with firm-specific (*institutional logic*, *firm size*, and *family business*) and sector-specific characteristics (*technological intensity*).

We identify the predominant *institutional logic* on the basis of the founding values self-identified by firms, namely, knowledge sharing, orientation to innovation, freedom, hierarchical coordination, customer orientation, and pragmatism. Scholars have acknowledged how knowledge sharing, freedom, and orientation to innovation represent values that characterise firms primarily pursuing scientific logic (Sauermann and Stephan 2013) and how bureaucratic and hierarchical control and customer focus as means to capture economic returns and pragmatic decision making to improve efficiency are associated with commercial, market-oriented logic (Murray 2010). The literature has also posited that although firms may incorporate multiple logics (Greenwood *et al.* 2011), they may be instantiated differently, with one logic being central and predominant to organisational functioning and with other logics being less core (i.e. peripheral) to organisational functioning (Besharov and Smith 2014). Building on this distinction, we claim that if a firm has selected more values associated with scientific logic (i.e. the first three), it has a predominantly central *scientific-oriented* logic; if a firm has selected more values associated with market logic (i.e. the latter three), it has a predominantly central *market-oriented* logic. The residual cases are categorised as *others* because they incorporate multiple logics that are equally dominant, that is, the number of scientifically related values selected is equal to the number of market-related values (i.e. three, two, or one value for both logics).

With regard to size, we distinguish between small and medium-sized enterprises (SMEs) (less than 250 employees) and large firms. We aggregate *technological sectors* into high- and medium-high tech sectors and medium-low and low tech sectors. *Family business* is identified by a binary indicator that takes the value of 1 if at least 50% of the capital is owned by a family.

Tables 4 to 7 report the contingency tables of DDD and SM firms by *institutional logic*, *size*, *technological sectors*, and *family business* in the two periods (before and after 8 March 2020). They also show the results of Fisher's exact test of correlation, which reveal whether the differences in the adoption of DT practices are associated with firm- and technology-specific factors.

In terms of *institutional logic* (Table 4), we observe that before the pandemic, more market-oriented firms or other firms used DDD and SM than scientifically oriented firms. At the same time, 8 out of 31 (i.e. 26%) firms with scientifically related logic adopted DDD whilst 11 of 71 (i.e. 15%) market-oriented or other firms adopted DDD; in terms of SM, the pattern is similar but with higher shares (42% and 24%, respectively). After 8 March 2020, fewer firms with both types of logic adopted DDD and SM, although there seems to be a higher persistence of firms with scientifically related logic in DDD and SM in the second period. However, despite the differences in the frequencies pre- and post-COVID, we fail to reject the hypothesis of independence between *institutional logic* and each of the two managerial practices (the p-values are larger than 0.05). This suggests that having a specific logic does not constitute a relevant factor in explaining the systematic differences in DDD or SM.

Tab. 4: DT by institutional logic

Before 8 March 2020				After 8 March 2020			
	Market or other	Scientific	Total		Market or other	Scientific	Total
DDD=0	60	23	83	DDD=0	67	25	92
DDD=1	11	8	19	DDD=1	4	6	10
Total	71	31	102	Total	71	31	102
Fisher's exact test: p-value = 0.271				Fisher's exact test: p-value = 0.063			
SM=0	54	18	72	SM=0	60	21	81
SM=1	17	13	30	SM=1	11	10	21
Total	71	31	102	Total	71	3	1
Fisher's exact test: p-value = 0.097				Fisher's exact test: p-value = 0.066			

Source: Authors' elaboration

With respect to *size* (Table 5), more large firms used DDD and SM before 8 March 2020 in comparison with SMEs. Specifically, 8 out of 23 (34%) large firms adopted DDD whilst 13 out of 23 (56%) used SM; by contrast, 11 out of 79 (14%) SMEs used DDD whilst 17 out of 79 (21%) used SM. These differences are statistically significant in Fisher's test of correlation ($p < 0.05$). Moreover, these differences persist in the results pertaining to DDD during the pandemic, although they are not statistically significant. Meanwhile, a smaller number of SMEs adopted advanced SM

in comparison with large firms, and these differences in both periods are statistically significant. Thus, size appears to be a relevant factor for DDD only in the first period and for SM in both periods. The differences between SMEs and large firms for the period after 8 March 2020 remain, although they are smoother. Our results confirm the difficulties of SMEs in undertaking DT because of limited resources and capabilities (Li *et al.* 2018; Bettiol *et al.* 2021).

Tab. 5: DT by size

Before 8 March 2020				After 8 March 2020			
	Large firms	SMEs	Total		Large firms	SMEs	Total
DDD=0	15	68	83	DDD=0	20	72	92
DDD=1	8	11	19	DDD=1	3	7	10
Total	23	79	102	Total	23	73	102
Fisher's exact test: p-value = 0.034				Fisher's exact test: p-value = 0.69			
SM=0	10	62	72	SM=0	12	69	81
SM=1	13	17	30	SM=1	11	10	21
Total	23	79	102	Total	23	79	102
Fisher's exact test: p-value = 0.003				Fisher's exact test: p-value = 0.001			

Source: Authors' elaboration

The differences between firms in the higher and lower technology sectors are not straightforward (Table 6). Not surprisingly, the share of firms with heavy commitments to DDD and SM in the first period is larger in the medium-to-high tech sectors. However, we note a remarkable drop in the number of firms on the frontier of DDD and SM practices in the second period. Moreover, the differences between sectors in terms of DDD in either period are not statistically significant possibly because of a high variance across firms within sectors in the first period and a substantial drop in the number of heavy DDD adopters in the higher technology sectors in the second period. The lack of a significant difference in DDD adoption between higher and lower tech firms may be explained by the characteristics of our sample, which includes the most productive firms in Lombardy; therefore, even firms in lower tech sectors are likely to use data (e.g. to better manage the value chain or monitor their costs).

The differences in SM between the two sectors in both periods are statistically significant ($p < 0.05$), with higher tech firms being more heavily committed to SM before 8 March 2020. Although the crisis put a strain on their managerial practices in the second period, a larger share of firms in sectors with higher technological intensity maintained a high commitment to well-defined management practices, such as individual performance bonuses. This result is in line with the fact that firms in higher tech sectors typically invest more in R&D, IT, and skills.

Tab. 6: DT by technological sectors

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Before 8 March 2020				After 8 March 2020			
	Low/ Medium- low tech	Medium- high/High tech	Total		Low/ Medium- low tech	Medium- high/High tech	Total
DDD=0	46	37	83	DDD=0	47	45	92
DDD=1	7	12	19	DDD=1	6	4	10
Total	53	49	102	Total	53	49	102
Fisher's exact test: p-value = 0.203				Fisher's exact test: p-value = 0.74			
SM=0	43	29	72	SM=0	47	34	81
SM=1	10	20	30	SM=1	6	15	21
Total	53	49	102	Total	53	49	102
Fisher's exact test: p-value = 0.018				Fisher's exact test: p-value = 0.026			

Source: Authors' elaboration

A higher share of *non-family* firms were heavily committed to DDD in both periods (Table 7). In the first period, 11 out of 78 (14%) and 8 out of 24 (33%) *family* and *non-family* firms engaged in DDD, respectively. However, these differences are not statistically significant. Meanwhile, a much larger share of *non-family* firms used SM in both periods (16 of 24 or 66% and 12 out of 24 or 50%), and the differences with family firms in both periods are statistically significant ($p < 0.05$). Therefore, although ownership does not explain the differences in the adoption of DDD, it explains the more frequent adoption of SM by non-family businesses. Family firms are indeed very heterogeneous, but they are inherently different from other firms because they are typically oriented towards the preservation of their socio-emotional wealth, which refers to nonfinancial aspects or social and affective endowments (Berrone *et al.* 2012), such as maintaining influence on the firm and passing the business to the next generation. In particular, family firms may invest less in talent management (Basco *et al.* 2021), although they offer a loyal, stable, and long-term relationship with employees (Rondi *et al.* 2021). Therefore, our results confirm the use of less SM in favour of other means, such as social capital and family influence.

Tab. 7: DT by family business

Before 8 March 2020				After 8 March 2020			
	Non-family	Family	Total		Non-family	Family	Total
DDD=0	16	67	83	DDD=0	21	71	92
DDD=1	8	11	19	DDD=1	3	7	10
Total	24	78	102	Total	24	78	102
Fisher's exact test: p-value = 0.068				Fisher's exact test: p-value = 0.69			
SM=0	8	16	72	SM=0	12	69	81
SM=1	16	14	30	SM=1	12	9	21
Total	24	78	102	Total	24	78	102
Fisher's exact test: p-value = 0.000				Fisher's exact test: p-value = 0.000			

Source: Authors' elaboration

6. Discussion and conclusion

In this study, we focus on two complementary dimensions of DT before and during the pandemic: DDD and SM. The challenges faced by firms engaged in DT are substantial during normal times and have become even more demanding during the pandemic.

To answer the first research question, we explored each dimension and its components. For DDD, whilst the availability and use of data increased during the pandemic, the number of KPIs and combined targets decreased. By considering the different dimensions of DDD together, we find that the number of firms with a high commitment to DDD declined between the two periods. A much larger share of the sample firms adopted SM practices, such as individual and team bonuses and promotion mechanisms based on performance and ability rather than tenure. However, the share of firms that adopted SM declined during the pandemic. Hence, both indicators suggest that the commitment to DT has slowed down during the pandemic, signalling that on average, the sample firms had to concentrate their efforts on solutions for more basic problems, such as the organisation of distant work and bottlenecks in the supply chain. In all probability, the financial constraints due to the slowdown of operations have contributed to the reduced investments in DDD and SM. Therefore, our response to the first research question is that firms have slowed their DT as a response to the COVID-19 crisis.

To address the second research question about the types of firms that undertake DT in response to the COVID-19 crisis, we correlate the changes in DT during the pandemic with various factors. Differences in the two DT dimensions are only partially explained by *institutional logic* (scientifically oriented values vs market-oriented values), *firm size*, *technological sectors*, and *firm ownership* (*family business vs non-family business*). In particular, as far as DDD is concerned, we find a correlation only with *firm size* before the pandemic. As far as SM is concerned, we find that all factors, except *institutional logic*, explain firm heterogeneity. Hence, to answer our third research question, we observe the limited relevance of institutional logics as a discriminant factor in the adoption of DDD, which is probably because the effective use of data would equally benefit scientifically oriented firms and firms that are more oriented towards customers' demand and market values. We find that the importance of firm size as a discriminant factor for DDD is probably due to economies of scale in data management and previous higher investments related to ICT and skills. Larger firms show a higher level of commitment to SM than SMEs, and this commitment persists over time probably because their greater organisational complexity makes the adoption of SM practices more compelling.

It is important to note that the differences in SM practices between groups (e.g. SMEs vs large firms, high tech and low tech sectors, and family business vs non-family business) persisted during the pandemic despite the generalised decline in SM frequency. Meanwhile, the differences between groups in terms of DDD practices in both periods were less significant and tended to disappear during the pandemic period. This suggests that SM is more deeply rooted in the organisation and is thus less

affected by the turbulence of the external environment. Conversely, DDD practices are more vulnerable to crises because they may be less embedded in the organisation and have been adopted only recently by firms. Another reason could be that they are inherently more complex to pursue in fast-changing and uncertain scenarios, such as a pandemic; for example, extracting relevant information from data during the pandemic could be more challenging than assigning bonuses (whose criteria have probably been established long before the beginning of the pandemic).

Our analysis contributes to the literature on DT in various ways. Firstly, we highlight two important dimensions of DT (i.e. DDD and SM) which have been analysed in a few earlier studies and deserve further in-depth analysis. Secondly, we provide a preliminary and exploratory overview of how the COVID crisis has affected DT. Our findings highlight the importance of firm- and industry-specific factors that affect DT before and after the pandemic. Therefore, these factors contribute to a better understanding of firm heterogeneity in DT under different economic conditions.

This study has valuable implications for business practice. Firstly, the results show that despite the fact that COVID-19 may have accelerated digital investments, the management of DT is particularly challenging for organisations, especially during turbulent times. Technologies and data may open up new business opportunities, but organisations must adapt accordingly. This calls for managerial focus on how to navigate the DT, possibly with a strong attention to leadership skills, such as awareness of data availability and technologies, fast execution and experimentation to facilitate organisational learning whilst reducing the risk associated with ex-ante planning, and the integration of digital processes within the existing organisation by facilitating the communication and interplay between ‘digital’ business units and people and their ‘physical’ counterparts and fostering the widespread acceptance of a new digital culture at various organisational layers (Hanelt *et al.*, 2021). Secondly, although the small sample size limits the significance of the results, we find evidence of differences in the rate of DT adoption between large firms and SMEs and between family-owned firms and other firms. This finding may yield substantial long-term implications for the capacity of smaller family-owned firms to adapt to DT and maintain their competitive advantage. Entrepreneurs and top managers of these firms must be aware of the importance of DT even during crises. Thirdly, organisations with predominantly scientific institutional logic appear to adopt DT roughly at the same rate as organisations with market logic. This suggests that the managers of these firms should not take for granted the fact that scientific institutional logic puts their organisation in a favourable position in successfully adapting to DT. It is likely that the managerial challenges in integrating digital tools within scientifically oriented organisations may be as strong as those in organisations with more market-oriented approaches.

This study has various limitations, but it also raises interesting and relevant points for future research. Firstly, although this is a descriptive and exploratory analysis, the findings provide a useful basis for future research that will dig deeper into the causal links between firms’ characteristics and

DT and how this relationship varies as a consequence of a shock like a pandemic. Secondly, although our study is centred on one of the largest manufacturing regions in Europe, future research is needed to extend the analysis to other locations to determine the level of generalisation of our results.

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 Impact of COVID-19 on
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Appendix

A) DDD

1. KPI

D2 Which ones of the following key performance indicators (KPI) was monitored by your firm in the first and the second period (mark all that apply)?

	Before DPCM 8 March 2020	After DPCM 8 March 2020
Measures of customer satisfaction (e.g. retention rate and rebuy rate)	<input type="checkbox"/>	<input type="checkbox"/>
Client response time (e.g. pre- and post-sale assistance)	<input type="checkbox"/>	<input type="checkbox"/>
Profitability (ROS, return on sales)	<input type="checkbox"/>	<input type="checkbox"/>
Productivity (added value/employees)	<input type="checkbox"/>	<input type="checkbox"/>
Time to market (time between the idea about a new product/service and its market introduction)	<input type="checkbox"/>	<input type="checkbox"/>
Growth rate of revenues	<input type="checkbox"/>	<input type="checkbox"/>
Number of patents per year	<input type="checkbox"/>	<input type="checkbox"/>

2. *Availability of data*

E1 Which of the following conditions best described the availability of data to support decision making in your company in the first and the second period?

	Before DPCM 8 March 2020	After DPCM 8 March 2020
None	<input type="checkbox"/>	<input type="checkbox"/>
Limited	<input type="checkbox"/>	<input type="checkbox"/>
Moderate	<input type="checkbox"/>	<input type="checkbox"/>
High	<input type="checkbox"/>	<input type="checkbox"/>
Complete	<input type="checkbox"/>	<input type="checkbox"/>

3. *Use of data*

E2 To what extent is the decision-making process in the company based on the use of data to support decisions in the first and second period?

	Before DPCM 8 March 2020	After DPCM 8 March 2020
None	<input type="checkbox"/>	<input type="checkbox"/>
Limited	<input type="checkbox"/>	<input type="checkbox"/>
Moderate	<input type="checkbox"/>	<input type="checkbox"/>
Heavily	<input type="checkbox"/>	<input type="checkbox"/>
Entirely	<input type="checkbox"/>	<input type="checkbox"/>

4. *Short- and long-term targets*

D3 What best describes the time frame of targets in your company, in the first and second period?

	Before DPCM 8 March 2020	After DPCM 8 March 2020
Main focus was on less than one year (short-term)	<input type="checkbox"/>	<input type="checkbox"/>
Main focus was on more than one year (long-term)	<input type="checkbox"/>	<input type="checkbox"/>
Combination of short-term and long-term targets	<input type="checkbox"/>	<input type="checkbox"/>
No targets	<input type="checkbox"/>	<input type="checkbox"/>

B) SM

1. *Productivity problems*

D1 What best describes what happened at a typical establishment of your firm when a productivity problem arose (e.g. long response time to requests by other units, or unsatisfactory solution of problems indicated by external clients)?

	Before DPCM 8 March 2020	After DPCM 8 March 2020
No action is taken	<input type="checkbox"/>	<input type="checkbox"/>
The problem is fixed but the firm does not take further action	<input type="checkbox"/>	<input type="checkbox"/>
The problem is fixed, and we took actions to make sure that it did not happen again	<input type="checkbox"/>	<input type="checkbox"/>
The problem is fixed, actions are taken to prevent that the problem will happen again, and a process to anticipate similar problems is activated	<input type="checkbox"/>	<input type="checkbox"/>

2. Performance bonuses

D6 What were performance bonuses of managers and employees usually based on at this establishment in the first and second period (mark all that apply)?

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	Before DPCM 8 March 2020		After DPCM 8 March 2020	
	Top managers	Middle managers and employees	Top managers	Middle managers and employees
Their own performance as measured by targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Their team performance as measured by targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Their office or department performance as measured by targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Their company's performance as measured by targets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No performance bonuses assigned	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Promotion criteria

D7 What was the primary way managers and employees were promoted at this establishment?

	Before DPCM 8 March 2020		After DPCM 8 March 2020	
	Top managers	Middle managers and employees	Top managers	Middle managers and employees
Promotions were based solely on performance and ability	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promotions were based partly on performance and ability, and partly on other factors (for example, tenure)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Promotions were based mainly on factors other than performance and ability (for example, tenure)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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End-of-life management of oil and gas offshore platforms: challenges and opportunities for sustainable decommissioning¹

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Abstract

Purpose of the paper: The decommissioning of offshore platforms represents a significant and controversial challenge that has gained attention over the years due to its environmental, social, and economic impact. This work aims to investigate stakeholders' perceptions regarding the future of offshore platforms and to explore dimensions of sustainability related to decommissioning.

Methodology: An analysis was carried out based on two rounds of empirical inquiry, a range of primary data collected through multiple-choice questionnaires and in-depth interviews.

Findings: The analysis shows that stakeholders perceive reuse as an opportunity to minimise the impacts according to an environmental, economic, and social perspective. While the multipurpose platform represents an opportunity for the future, it also presents challenges.

Research limitations: The study relies only on qualitative analysis techniques and on a limited sample and geographical area.

Practical implications: The analysis offers several insights into the decommissioning scenario according to a sustainable and circularity perspective and contributes to the decommissioning debate by providing information about decommissioning programs, stakeholders' impacts, and future planning considerations.

Originality of the paper: The study contributes knowledge to the field and useful managerial insights, highlighting stakeholders' perception in the Italian context and exploring dimensions of sustainability and main SDGs related to the issue.

Key words: sustainable development; circular economy; decommissioning; offshore platforms; end life management

1. Introduction

In recent years, national and international attention to global issues affecting the environment has increased, including attention to the decommissioning of offshore platforms, which is a multi-disciplinary issue. The industry has been increasingly interested in evaluating the environmental impact of decommissioning, as well as increasing public awareness about it. Decommissioning is also a key pillar of the

¹ *Acknowledgements:* This research is part of a larger European offshore platform conversion project called PON-PlaCE (Offshore Platform Conversion for Eco-Sustainable Multiples Use - cod. ARS01_00891)

global energy system and, as such, is a driver of economic and social development. More than 7500 offshore oil and gas structures have been built in over 53 countries (Parente *et al.*, 2006; Lakhal *et al.*, 2009; Techera and Chandler, 2015). Moreover, a growing number of oil and gas platforms and facilities have come to the end of their expected life, having exhausted the extractable oil reserves (Day and Gusmitta, 2016). Decommissioning activity represents a significant investment, without a possibility of return on investment (ROI). A relatively new challenge to most producer countries and energy companies, decommissioning aims to balance the sensitive threshold between minimizing financial and human costs and protecting well-being and the environment (Fam *et al.*, 2018).

In this context, adopting sustainable methods involving a circular approach to decommissioning programs represents a game-changing opportunity to manage resources within planetary limits. The actions set out in the oil and gas decommissioning sector through a circular economy (CE) approach can contribute to the fulfilment of the sustainable development goals (SDGs). Understanding the circularity of products and services (or their contribution to the CE) is indeed crucial in designing policies and business strategies in the oil and gas industry. Key features of circularity include lifecycle thinking and the elimination of waste. In recent years, programs oriented towards reusing obsolete facilities for marine research, aquaculture, renewable energy technologies, or leisure or towards recycling materials from the structure have emerged (Techera and Chandler, 2015; Chandler *et al.*, 2017; Buck and Langan, 2017). Reducing the harms associated with decommissioning of oil and gas offshore platforms allows for the creation of new economic opportunities and environmental improvements. Although in the past the environmental impact of decommissioning has lacked visibility, in recent years, thanks to greater general awareness, stakeholders have become more interested.

Decommissioning of offshore platforms is currently a highly relevant topic in Mediterranean regions. It is proposed as a priority topic for the next biennium 2022-2023. An examination of the technical evaluation of removal methods, sustainability implications, environmentally sound management, and optimal treatment is needed. In Italy, there are numerous offshore installations, and the decommissioning of several structures is expected soon. In the national regulations, decommissioning includes structural dismantling, removal of platforms, and restoration of the area's original condition. However, the considerable cost of social and economic decommissioning has led to a gradual change in regulations in favour of a sustainable and circular approach.

In this context, this research aims to investigate stakeholders' perceptions regarding the future of offshore platforms and the opportunities and challenges related to the sustainable and circular approach to decommissioning. By leveraging the dimensions of sustainability, scenarios of platforms' reuse through sustainability pillars have been discussed. The paper is structured as follows. Section 2 provides an overview of the end-of-life management of platforms and explores the

literature on sustainability and circularity, highlighting the importance of sustainable development and the application of circular principles in oil and gas decommissioning programs. Section 3 presents the research methodology, and Section 4 presents the research results; Section 5 discusses the main findings. Conclusions are drawn in Section 6, which identifies practical and managerial implications and research limitations and suggests further research directions.

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End-of-life management
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2. Theoretical background

2.1 The end-of-life management of oil and gas offshore platforms

The typical oil and gas project lifecycle includes acquisition, exploration, drilling, production, and decommissioning phases. Decommissioning is the final stage of the life cycle of assets in the oil and gas supply chain. Decommissioning activity is projected to grow significantly by 2040 (EIA, 2018). It includes all activities necessary to manage and dispose of installations and platforms and to restore the environment, in particular:

- pre-abandonment surveys, development of a decommissioning plan and submission for regulatory approval, plugging and abandonment of wells, dismantling and removal of topsides, subsea structures and pipelines, and disposal of associated waste;
- reverse engineering structures to dismantle them safely and efficiently;
- destruction or recycling of substantial waste products, including hazardous chemicals;
- substantial environmental remediation, which can have important economic, social, and environmental implications in the context in which it is realised.

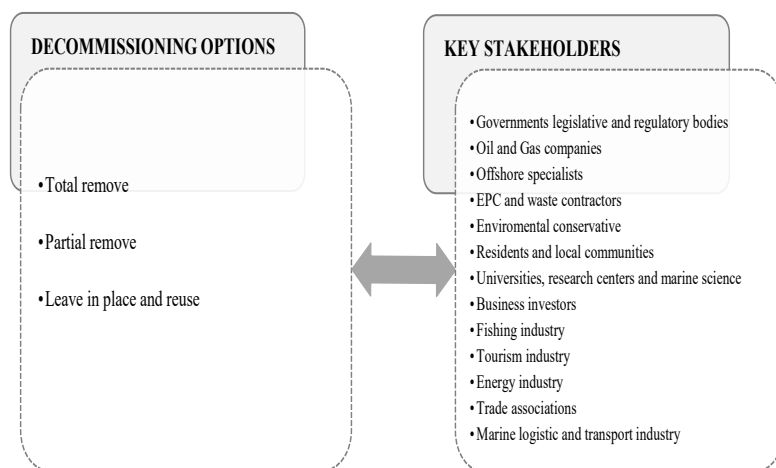
Each offshore platform structure is different and therefore requires a customised approach to be decommissioned. Generally, the end-of-life options for offshore infrastructure include (I) total removal, (II) *in situ* decommissioning (by leaving the infrastructure in place either completely intact or with its topsides removed and legs toppled), (III) removal and relocation offshore (for example, as a dive site or fishery), and (IV) partial removal (removing parts of the infrastructure while leaving others *in situ*) (Ekins *et al.*, 2005).

Different strategies for decommissioning derive from complex and intercorrelated environmental, technical, economic, and safety aspects. Policies of removal, which are generally adopted in regulation frameworks, assume that the seabed is left unaltered and can represent the most environmentally sound decommissioning option, but disposal is expensive. As an alternative to total removal, other decommissioning options are characterised by their impact on the environment, costs, and socioeconomic and security aspects. Martins *et al.* (2020) have reviewed how a multicriteria analysis has been used in oil and gas decommissioning decisions, investigating the main aspects and methods of this analysis.

According to the literature (Schroeder and Love, 2004; Sommer *et al.*, 2019), the major environmental issues arising in decommissioning regard the potential effects on the marine ecosystem, the appropriate use and containment of hazardous substances, including naturally occurring radioactive material, and waste management, which includes finding a destination for the debris accumulated over the life cycle of a piece of equipment (Cripps and Aabel, 2002; Almeida *et al.*, 2017). Scholars have observed that the structure of the oil and gas platform may provide important habitats to ensure population connectivity: marine ecosystems evolve below the surface on and around offshore oil and gas structures throughout their operational life. Hence, these platforms present great ecological opportunities for marine ecosystem enhancement or restoration and offer both ecological and economic opportunities (Van Elden *et al.*, 2019). Over the past 50 years, global guidelines and regulations have emerged as decommissioning activities have risen significantly, calling for guidelines for the protection of the marine environment and the rights of other parties (local communities, industries, etc.). Global conventions and guidelines have been purposely introduced in the oil and gas industries to minimise the risk and threats induced by decommissioning operations. The Article n. 60 of the United Nations Convention on the Law of the Sea and Resolution A.672 adopted in 1989 as part of the International Maritime Organization provided guidelines and a framework for decommissioning; however, there is a range of alternatives to be exploited case by case in the national and international contexts (Fowler *et al.*, 2014).

Whether an offshore structure is to be fully or partially removed or left in place, decisions about oil and gas decommissioning have attracted considerable interest from a large number of different local, regional, and global stakeholders. Over the last decades, international and national regulatory, technological, and ideological frameworks have changed significantly, encouraging a new way to consider decommissioning. Social movements, which are pressing for ecological modernisation and sustainable development, have emphasised the importance of reducing waste and sharing resources (Arts and Leroy, 2006). As currently required by legislative bodies, oil and gas decommissioning activities must involve stakeholders extensively (Sommer *et al.*, 2019). However, certain stakeholders are not physically close to, nor directly involved in, the decommissioning process but can feel indirect impacts. In the literature and in practice, it has emerged that the process of decision-making about the future of offshore platforms has involved several direct and indirect stakeholders: oil and gas companies, national and local governments, regulators (nuclear and environmental protection regulators, etc.), offshore specialists, procurement and construction (EPC) contractors, waste supply chain contractors, port authorities, trade associations, local communities and residents, business investors, universities, research centres, and marine scientists (IAEA, 2009; Love, 2012; Invernizzi *et al.*, 2017; OECD/NEA, 2018; Sie *et al.* 2018; Genter, 2019). The main key stakeholders are included in Fig. 1.

Fig. 1: Stakeholders involved in decommissioning options



Source: Authors.

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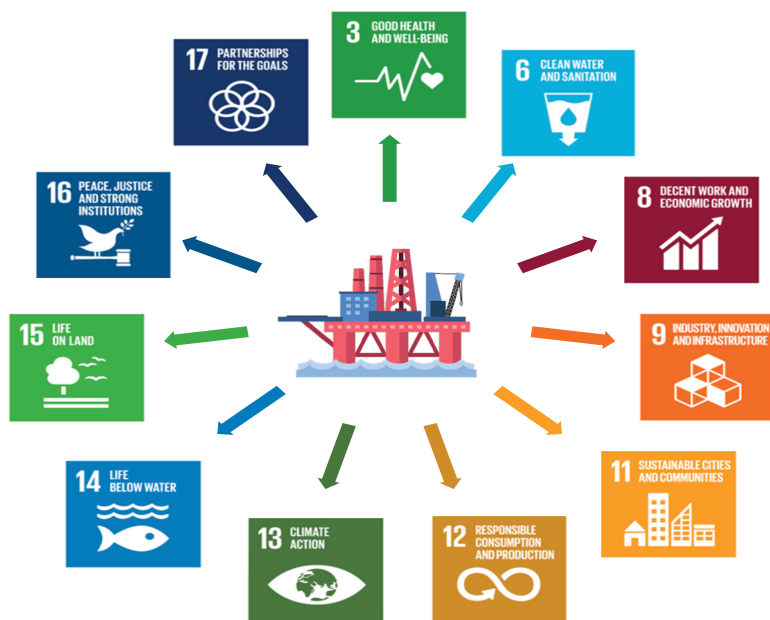
2.2 Integrating sustainability and circularity in decommissioning programs

In the last twenty years, the concepts of sustainability and sustainable development have generated increased interest not only from economics and business management scholars but also by policy-makers (Kates *et al.*, 2001; Komiyama 2006; Lang, 2012; Schoolman *et al.* 2012; Gore, 2015). Although these concepts were first introduced in response to environmental concerns, the sustainability paradigm has expanded to encompass the notion of “economic development”, which includes not only economic growth (increase in material wellbeing and distribution of wealth) but also environmental and social outcomes. Sustainability and sustainable development are important concepts in the oil and gas industry for several reasons: they not only potentially make companies wealthier (e.g., economic prosperity), but they also foster social justice and environmental protection. In a world that has become more connected and interdependent than ever before, sustainability is not an option: it is essential.

The contemporary sustainability literature has centred on the UN’s various sustainable development goals (SDGs) in which the three pillars of sustainability have been explicitly embedded (UN, 2012). The 2030 Agenda for Sustainable Development and its framework of 17 Sustainable Development Goals (SDGs) adopted by the United Nations General Assembly in September 2015 agree to “*protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations*”. (UNEP, 2015). The SDGs aim to address the world’s pressing environmental, economic, and social challenges (Colglazier, 2015). The sustainable development concept is frequently connected to the oil and gas

industry, which considers sustainability aspects in its strategic decision-making processes. The oil and gas industry can contribute to the realisation of different SDGs whether it enhances its positive actions towards the environment or avoids or mitigates its negative impacts. The oil and gas industry's operations and products can have positive and negative impacts on a range of topics covered by the SDGs, including communities, ecosystems, and economies. Recently, the United Nations Development Programme (UNDP), the International Finance Corporation (IFC) and the global oil and gas industry association for environmental and social issues (IPECA) have partnered to publish "Mapping the oil and gas industry to the Sustainable Development Goals: An Atlas". The oil and gas decommissioning program can act towards SDGs 3 (health), 6 (water), 8 (sustainable economic growth), 9 (industrialization and innovation), 11 (cities), 12 (sustainable consumption and production), 13 (climate change), 14 (oceans), 15 (terrestrial ecosystems), 16 (peaceful and inclusive societies) and 17 (means of implementation) (Fig. 2).

Fig. 2: Sustainable development goals in the decommissioning program



Source: Authors, based on UNEP (2015).

Many challenges, including health and well-being, pollution, global climate change, and biodiversity, have emerged in the oil and gas industry and in the end-of-life management of platforms. Table A1 in the Appendix indicates the main SDG dimensions and the opportunities to integrate SDGs into decommissioning programs. Recent studies have demonstrated a sustainable decommissioning approach in the energy industry (Topham *et al.* 2017; Invernizzi *et al.*, 2020; Zawawi *et al.*, 2012; Capobianco *et al.*,

2021). To integrate sustainability in decommissioning programs, social, environmental, and economic dimensions must be considered, as well as the ways in which these interconnect. The “Three Pillars” approach or “Triple Bottom Line” (Elkington, 1997) can be adopted to distinguish the three dimensions of sustainability: economic viability, social equity, and ecological integrity. When the three dimensions are separated, it is easy to operationalise the approach and to highlight trade-offs, especially in accounting and evaluation practices; therefore, policy-makers have widely accepted the three pillars approach, which has been included in many soft law documents and promoted within companies’ business management (Bosselmann, 2016). As a source of renewable natural loops, offshore platform end-of-life management should integrate the three dimensions of sustainability (environmental, economic, social) for sustainable decommissioning.

The circular economy has recently been popularised as a driver for sustainability (Geissdoerfer *et al.*, 2017; Schroeder *et al.*, 2019). In step with sustainable development, awareness is growing that we need to move from a linear to a circular economy. The current economic and industrial model, called the produce-use-dispose model, is a linear model. In this model, resources used are lost, which constitutes a waste of resources and money. The CE is based on three key activities, reduction, reuse, and recycling (the so-called ‘3R’s principles’), in the processes of production, consumption and circulation (Feng and Yan, 2007; Yong, 2007; Benton, 2015). The CE has relied on the restorative capacity of natural resources and has aimed to minimise - if not eliminate - waste, utilise renewable energy sources, and phase out the use of harmful substances (Ellen MacArthur Foundation, 2015). Such an economy goes beyond the “end of pipe” approaches of the linear economy (Chamberlin *et al.*, 2013) and seeks transformational changes across the breadth of the value chain to retain materials in the “circular economy loop” and preserve their value for as long as possible (Ellen MacArthur Foundation, 2014, Vanner *et al.*, 2014). The definition of the circular economy makes explicit the increasing pressure on our resources: the CE is “an economy in which stakeholders collaborate to maximize the value of products and materials, and as such contribute to minimizing the depletion of natural resources and create positive societal and environmental impact” (Kraaijenhagen *et al.*, 2016, p. 15). Additionally, Kirchherr *et al.* (2017) have proposed a definition of the CE that links the circular economy concept to the goal of sustainable development in all three dimensions (society, economy, and environment): “an economic system that replaces the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro-level (products, companies, consumers), meso level (eco-industrial parks) and macro-level (city, region, nation and beyond), to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity, and social equity to the benefit of current and future generations. It is enabled by novel business models and responsible consumers” (Kirchherr *et al.* 2017, p. 229).

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In a contest of decommissioning decisions, a circular approach can be implemented along a variety of strategies under four main categories in order of priority:

1. narrowing resource flows to reduce the number of materials going around in the economy (e.g., waste reduction, dematerialisation);
2. slowing the flow of resources between the point of manufacturing and disposal (e.g., repair and maintenance, lifetime extension, component reuse and refurbishment, remanufacture, disassembly);
3. closing the loop of resource flows (e.g., recycling, decommissioning);
4. safely integrating material flows back into natural processes (e.g., rigs-to-reefs, remining, and controlled landfill storage).

The circular approach contributes to sustainability by minimizing natural resource extraction and waste while optimizing environmental, social, technical, and economic values throughout the lifecycles of materials, components, and products (Velenturf *et al.*, 2021).

3. Methodology

3.1 Research design

To investigate stakeholders' perceptions about the future of offshore platforms and the opportunities and challenges related to the sustainable and circular approach in decommissioning, we conducted an empirical analysis.

The Italian context was selected for the analysis. Italian oil and gas installations are reaching the end of their economic life, and a program of decommissioning is underway. The oil and gas offshore structures in Italy include 138 platforms, which mostly extract gas, and out of which 12 are inactive and 34 will have to be decommissioned in the coming years (UNMIG, 2020). National legislation relating to the abandonment or decommissioning of physical structures used in oil and natural gas production has been developed. The abandonment of facilities and related infrastructures is forbidden. When a licence-holder wishes to decommission physical structures that have either become sterile, have exhausted a deposit, can no longer be used, or are not capable of further assuring production in commercial quantities, details of the shutdown must be provided with an authorization request from the National Mining Office for Hydrocarbons and Geo-resources (UNMIG) Section of the MiSE. The official list of offshore platforms being decommissioned is published by UNMIG on the Ministry of Economic Transition website and updated every year.

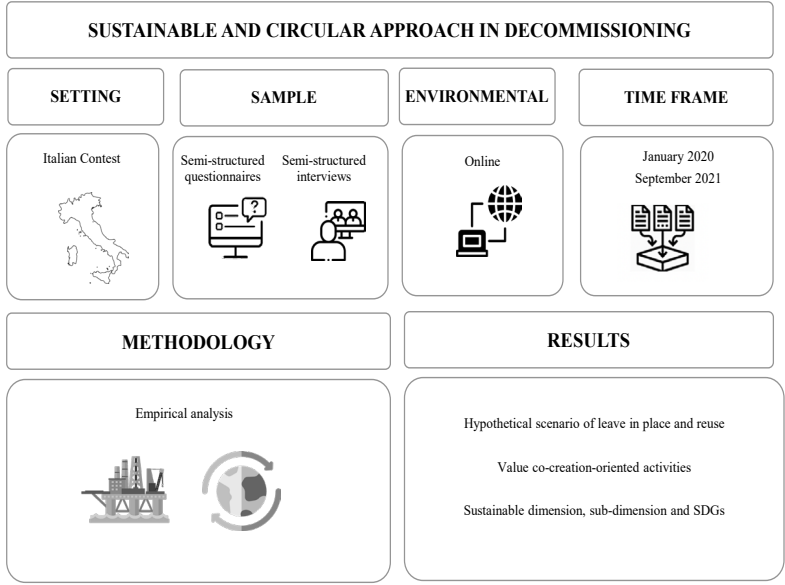
This study is based on a qualitative approach. Surveying key stakeholders' opinions and perceptions can contribute to the understanding of oil and gas decommissioning.

In this study, the data were collected from January 2020 to September 2021. Data collection was divided into three rounds of empirical inquiry.

First, multiple-choice questionnaires were used to investigate people’s perception about the challenges and opportunities generated by offshore platforms decommissioning in relation to sustainability and the circular economy. The final dataset included 33 answers To ensure a high response rate, the multiple-choice questionnaires were brief and easy to complete (taking respondents less than 15 minutes to fill). Second, in-depth semi-structured interviews focused on the multipurpose approach in hypothetical scenario of leave in place and reused of the platform. Third, explorative interviews were conducted with consultants involved in the decommissioning industry to validate the primary interviews and explore managerial visions about the future of offshore facilities. During the first round of data collection, topics of discussion included the decommissioning hypothetical scenario, the main purpose of the decommissioning program, key partners, and value cocreation-oriented activities in the leave in place and reuse scenario. Additionally, secondary data were collected from government publications, official websites, and news articles related to the industry, as well as reports and documents produced by regulatory agencies, oil and gas companies, EPC and waste contractors.

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Fig. 3: Research framework



Source: Authors.

3.2 Data collection and analysis

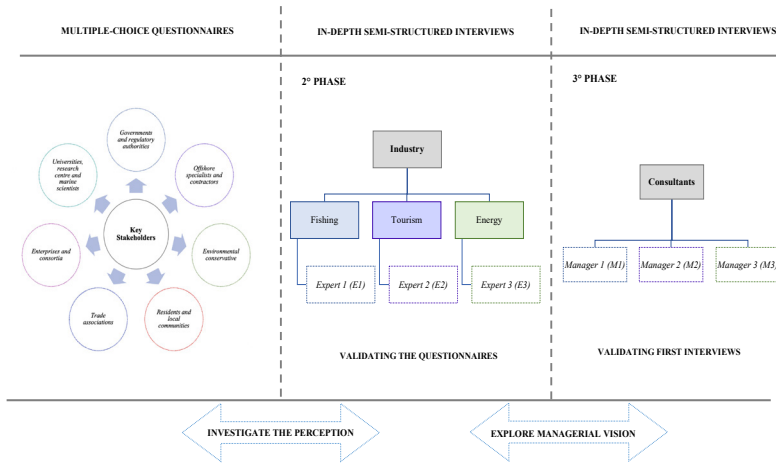
Semi-structured questionnaires were conducted online between January and April 2020 among a list of stakeholders identified within the Italian community (i.e., governments and regulation authorities, offshore specialists and contractors, trade associations, enterprises and

consortia, environmental conservation organisations, residents and local communities, universities, research and marine science centres). Based on their activities, the key stakeholders were chosen through desk research on decommissioning oil and gas platform-related activities. Each questionnaire included several sections: respondents' social demographic profile, evaluations of decommissioning scenarios, individuation of main partners and relevant activities in terms of value creation proposition in the hypothetical scenario of reuse, and prominent approaches enabling platform reuse. The data were entered into a database, coded, and processed for qualitative analysis. The authors used Excel as their qualitative data analysis tool (Meyer *et al.*, 2009).

In keeping with the purpose of the study, a number of in-depth semi-structured interviews were conducted with three experts related to the different industries (fishing, tourism, energy) that had emerged in the literature and the multiple-choice questionnaires and were considered relevant in terms of value creation proposition from the perspective of sustainable decommissioning. The interviews were conducted from March to September 2021 and focused on the perspectives of sustainable and circular challenges related to the hypothetical scenario of leaving in place and reusing Italian offshore platforms. Following the initial analysis of the first three interviews, specific lines of enquiry emerged around the reuse of platforms. To validate the first interviews and generate a deeper understanding of the phenomenon and explore managerial vision about the future of offshore facilities, the interview sample was broadened purposively to include consultants who were involved and linked to the decommissioning project. It was anticipated that, through their respective roles, these interviewees would provide different perspectives on oil and gas decommissioning.

The interviews were guided by a flexible interview protocol and supplemented by follow-up questions, probes, and comments. Since the interviews contained open-ended questions and discussions diverged from the interview guide, the experts were encouraged to interact. The interviews were transcribed manually, as well as recorded to guarantee a more consistent transcription (Creswell, 2012). Interviews were conducted by the researchers over the internet using Microsoft Teams. Following the transcription of all interviews, the transcripts were shared with the participants for accuracy and to determine whether they wished to add anything to their responses. As the study focused on a new phenomenon, the transcripts were initially analysed individually by all researchers, using a constructivist perspective. Following the initial analysis, the research team engaged in extended dialogue to refine the key themes that had emerged. Each interview lasted an average of 45 minutes, and the interview protocols were transcribed.

Fig. 4: Data collection and analysis



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4. Findings

This section describes the results of the multiple-choice questionnaires and in-depth exploratory interviews on the general perspective of sustainable decommissioning in the broader framework of the circular economy.

Primarily, the demographic profile of the study was analysed. The respondents mainly worked in the public sector; for instance, some were involved in local government. Among the 33 respondents, most were between 51 and 60 years-old. Additionally, most had degrees and a high level of education (Table 1).

Tab. 1: Respondents' profile

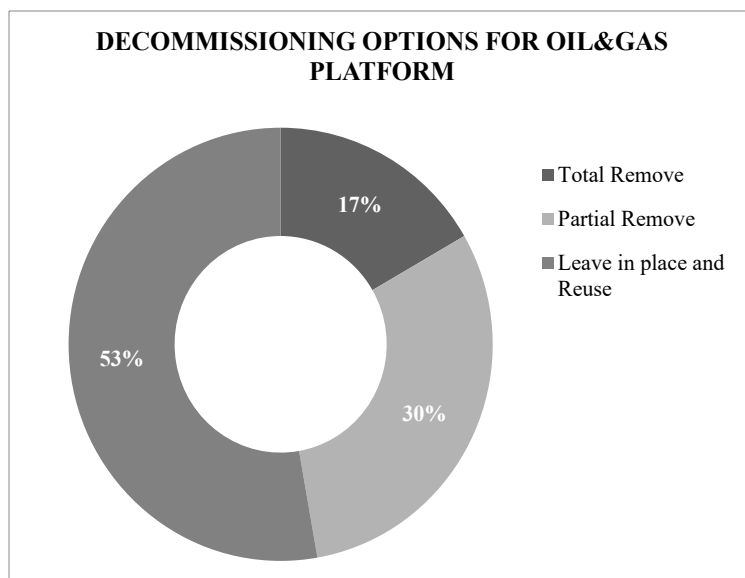
Characteristics	Participants N = 33 (%)
Sex	
Male	23 (70%)
Female	10 (30%)
Age range (years)	
18-25	1 (3%)
26-35	3 (9%)
36-50	10 (30%)
51-60	17 (52%)
>60	2 (6%)
Education level	
High School	6 (18%)
Msc	12 (36%)
Postdegree/Master/PhD	15 (46%)
Professional affiliation	
Public sector	17 (52%)
Private sector	11 (33%)
Associations and NGOs	5 (15%)

Source: Authors.

Decommissioning hypothetical scenarios

Considering that the impact of decommissioning decisions and end-of-life management goes beyond the industrial environment, it is essential to properly consider the perspectives of distinct stakeholders about different courses of action. As such, these decisions are politically sensitive and multidisciplinary in nature. Each offshore platform structure is different and therefore requires a customised approach to decommissioning. Generally, the end-of-life of offshore infrastructure includes total removal, partial removal, leave in place, and reuse. The analysis shows the high potential of leaving in place and reusing offshore platforms. For 53% of respondents, the scenario of leaving the platform in place and reusing it appears to be the most appropriate in terms of environmental and socioeconomic aspects (Fig. 5).

Fig. 5: Responses to questions about the decommissioning scenario



Source: Authors.

The interviews revealed the importance of searching for innovative solutions, processes and products aimed at applying the circularity principle, as well as the reuse and enhancement of waste materials to make the economic system more efficient while minimizing both resources and energy consumption: *"In the last decades, oil and gas industry investing in R&D activities to implement innovative technologies to protect offshore platforms from corrosion and so on, to reduce environmental impact [...] and to increase energy efficiency with low-carbon and climate-resilient technologies"* (M2). The interviewees were aware of the possibility of applying circularity principles and underlined that *"Materials can be*

retained and reused in a different context, instead of being disposed of as waste [...] structures can be reutilised with new functions, thus reducing the need for new investments as well as demolition costs [...]". (E3).

Protection strategies for reducing the risk to the health of employees and local communities are incorporated into the decommissioning process. An interviewee underlined that *"Decommissioning includes different needs to measure impacts systematically to reduce the risks of pollution and contamination as well as to use performance indicators to reduce the impact on the environment [...] in a scenario of reusing and sustainable development technologies and innovative system of measurement that can reduce health hazards limit environmental and social impacts"*. (M3). The implementation of decommissioning is usually undertaken by an oil and gas installation operator in consultation with the regulatory agencies. National guidelines for decommissioning offshore platforms and related infrastructures are approved and adopted to ensure the quality and completeness of the environmental impact assessment. Regarding best practices, one interviewee said, *"Regarding the sharing of best practices on decommissioning and reuse, it must be considered that the Italian panorama has not reached a level of maturity such as to develop its own best practices; these are instead present in other contexts (UK, Norway), which stand as references for the Italian context"* (M1).

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Key partners in the hypothetical scenario of leave in place and reuse.

The platforms represent a high-value asset not only based on the existing infrastructures but based on their nontangible features. These may include a strategic location, typically characterised by the proximity of large cities or touristic and cultural landmarks, access to coastal water or existing infrastructures, and an existing network of social and economic relationships established during the period of plant operation. These nontangible features enhance the possibilities for end use or conversion strategies. The results of the study highlight the important role of partners, such as international authorities (22%), national and local governments (15%), academia, and research centres (18%), in the scenario of leaving in place and reusing and in guiding the sustainable decommissioning program. EPC contractors (5%) and shipowners and naval cooperatives (5%) are considered marginal partners. Additionally, to implement the reuse of facilities, considerable attention is given to environmental organizations involved in the protection of the marine ecosystem (14%). Trade associations (12%) and business investors (9%) are also considered key partners in developing new business opportunities related to the reuse of facilities. In terms of social impact on local communities, *"a circular approach to decommissioning could create a positive impact in terms of job creation and minimise the negative impact in terms of job losses"* (M1). This trend is also reinforced by the possibility of applying strategies for the reuse of platforms and repurposing of materials. Regarding the main actors involved in Italy, the interviewees underlined that *"[...] the reference is the Ministerial Decree of 15.02.2019 on the national guidelines for the mining*

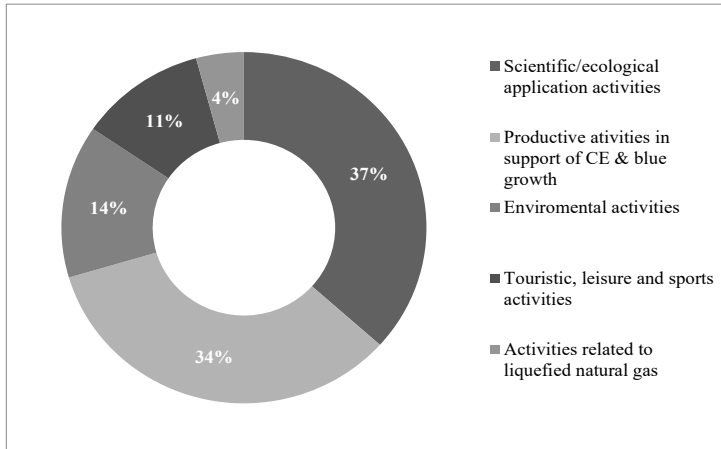
decommissioning of platforms and for the cultivation of hydrocarbons at sea and related infrastructures [...]. The main stakeholders are UNMIG, the Port Authority, the Environmental Protection Agency, and competent local administrations” (M2).

Approaches to decommissioning

Strategies based on the circularity approach to decommissioning might result in a significant increase in value for the asset compared to a linear approach. The oil and gas industry contributes to sustainable development in different ways (e.g., generating direct and indirect jobs, contributing tax and other types of revenue for governments, developing new technologies and products through investment in R&D, encouraging local entrepreneurship, investing in the long-term social and economic success of the communities in which they operate, and managing the impacts of its operations by emphasizing environmental protection, health, and safety). In the hypothetical reuse of a platform, respondents (70%) consider that a sustainable and circular approaches play a crucial role, followed by change and innovation in the culture of the industry (30%). In line with sustainable development and circular approaches, the interviews highlight the extension of the lifetime of (infra)structures through their conversion in the context of the energy transition. According to one *interviewee*, “sustainability and circular approaches are becoming increasingly important. [...] think also about the possibilities offered in reusing waste from other production processes and biomass to produce renewable energy. [...]. There are contractors’ companies that install structures to produce renewable energy on offshore platforms”. Furthermore, “the circular approach is intertwined with the future challenge of adopting more low-carbon energy systems” (E3).

Reuse constitutes a life extension program for the whole structure or part of the structure. Obsolete platforms could be transformed into strategic hubs that could host valuable and sustainable activities in terms of renewable energy, blue growth, and tourism, as well as a combination of value cocreation-oriented activities. Fig. 6 shows the results of the multiple-choice questionnaires that asked about which activities were considered more relevant for the territory and stakeholders involved in terms of value creation propositions during the offshore platform decommissioning process.

Fig. 6: Responses to questions about applying the leave in place and reuse strategy in platform decommissioning in terms of value cocreation-oriented activities



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Source: Authors.

Reusing platforms within the scientific-ecological hub is considered a relevant activity (37%); as reported by one expert, *“the platforms are optimal sites because they are in the open sea away from underwater currents [...] the platforms act as a shelter for fish, and this amplifies the underwater microenvironment”* (E1). Some oil and gas platforms should be reused with the energy transition in mind to enable their infrastructures to be repurposed and integrated in sustainable energy systems. For example, their infrastructures could be used for blue and green hydrogen production, carbon capture and storage, and offshore wind production. According to the interviewees, *“in terms of sustainable and blue growth initiatives, a multidisciplinary research centre should be created to develop and combine different reuses of offshore platforms. [...] European funds for a sustainable and circular economy and financial incentives for reuse initiatives are crucial [...] a fund system for reuse may even be established to provide financial incentives or compensation to keep installations in place that can be reused”* (E1). On one hand, the use of offshore platforms as a base for a single activity is uneconomic; on the other hand, the combination of aquaculture systems with wave energy devices or tourism-recreational activities can generate value. The interviewees explained that *“aquaculture is also one of the blue growth sectors, and synergies have been found with tourism”, adding that “in areas where ‘sustainable’ forms of aquaculture are practised, these can provide good-quality seafood to tourists, etc. [...] shell and fish farmers can enhance the area’s attractiveness by offering tours on their vessels for tourists to visit their farms, creating educative and recreational poles”* (E2). Moreover, the platform can be left in place and reused for recreational activities (such as tourism, leisure, and sports activities): *“the platforms are optimal sites because they are in the open sea, away from underwater currents; then, interesting opportunities for leisure and sports activities (e.g.,*

diving sport, snorkeling, etc.) can be created along the bottom structures of the marine ecosystem sheath" (E2). Tourism development policy is usually delegated to the regional and local levels of government and rarely carried out at the national level. An important driver of conflict is the diversity in the tourism sector and the variety of needs associated with different types of tourism. One of the interviewees explained that *"there is a tendency towards tourism diversification, meaning more sustainable forms of tourism are emerging"* and that *"experience-based tourism with a focus on scenic, cultural and environmental assets and local traditions and production attracts more affluent and discerning types of tourists"* (E2). The reuse of facilities for different activities can increase their socioeconomic value; according to interviewees, *"the possibility of reusing offshore platforms could undoubtedly be an opportunity for the revitalisation of coastal areas [...] socioeconomic value can be created through the reuse of the facilities for touristic-recreational uses"* (E2). The national government and authorities control what types of infrastructure may be available to support the redevelopment of a site and can often provide resources from the jurisdictional budget or through their access to regional or national economic development grants. One interviewee underlined that *"productive reuse of facilities being decommissioned, especially when attracting new industries, could offset the decline in employment"* (M3). In the face of cocreation-oriented activities, multistakeholder engagement is needed: *"To create social and economic value is important for a collaboration and complementary partnership across government, civil society, and the private sector [...] current initiatives around sector integration and coupling envisage the reuse of existing assets for new purposes such as hydrogen, carbon dioxide or biogas transport"* (E1).

Thus, the findings suggest that the reuse of platforms may significantly contribute to environmental, social, and economic benefits and provide potential evidence that platforms can remain in place and be reused to create value through multipurpose use. Alternative uses range from aquaculture and tourism to alternative energy production and the establishment of scientific and ecological hubs, which are intended to preserve the biological communities that are supported by the platforms and to enhance biological production or fishing opportunities. The results highlight that the reuse of unprofitable or discontinued facilities, which are given a new life and a sustainable and low-carbon future, is part of a sustainable strategy that the Italian stakeholders who were interviewed share widely. However, although the energy transition has gained momentum, many oil and gas platforms continue to be commissioned.

5. Discussion

The analysis reveals that a sustainable and circular approach has emerged in the decommissioning process as a value cocreation that drives the future of these structures. Concepts and processes of CE aim to minimise waste and to make efficient use of available resources (e.g.,

through design considerations, careful operation, and the recovering and regenerating of products at the end of a facility's life cycle). In a perfect circular or closed cycle, all waste products are reused. If decommissioning incorporates CE approaches, it is possible to reduce the need for disposal and create long-term, more economical and ecological waste management solutions with added value for society. Therefore, CE strategies deliver a wide range of benefits, including reduced waste, lower costs, and greater sustainability.

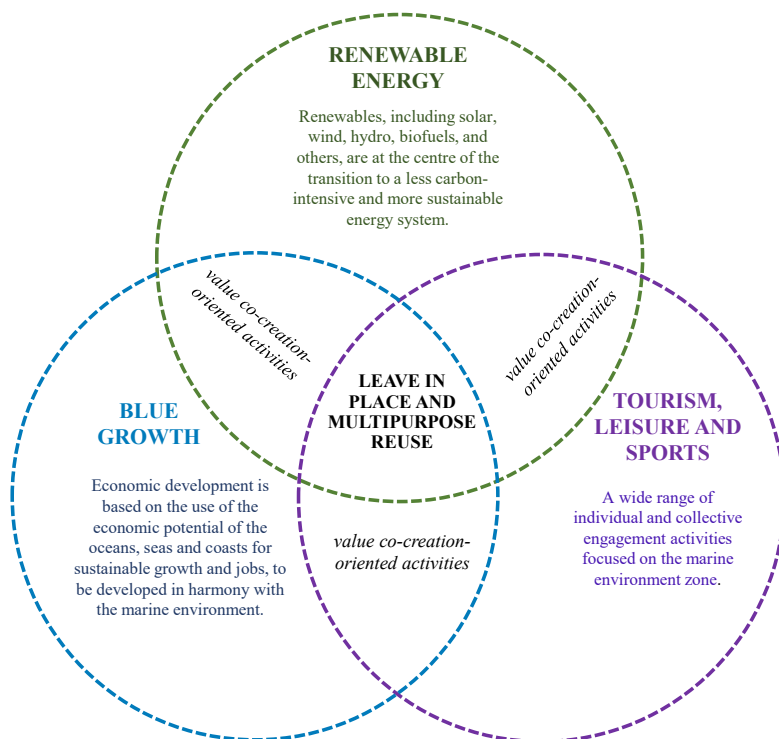
When applying CE strategies to decommissioning, experts face two different situations: first, the sustainable decommissioning of older facilities that were designed and operated with little consideration for sustainability poses specific challenges. Second, to achieve a meaningful circular economy in decommissioning, project managers need to balance the cost of decommissioning and correlated efforts with social and environmental concerns such as radiological risks and the treatment of specific waste streams. In both cases, they rely on technical, regulatory, and social innovations to find the best possible solutions.

Several alternatives that are in line with sustainable development and show awareness of the circularity approach have emerged from the literature and have been proposed for the complete removal of decommissioned offshore oil and gas platforms:

- Platforms for photovoltaic farms (Pimentel Da Silva *et al.* 2018);
- Offshore wind energy projects, either as sites for wind turbines or as offshore maintenance and logistics areas (Smyth *et al.*, 2015; Topham and Mcmillan, 2017);
- Offshore wave energy projects, either as sites for anchoring wave energy generating equipment or as offshore maintenance and logistics areas (Smyth *et al.*, 2015);
- Offshore wind hydrogen projects (Leporini *et al.*, 2019);
- Liquefied natural gas (LNG) terminals (Gondal, 2019);
- Marine farming that includes farming finfish, shellfish and aquatic plants (Buck and Langan, 2017);
- Installation of sea instruments or other equipment into and out of wells;
- Marine protected areas or artificial reefs, either left in place or relocated to a designated reefing location (rigs-to-reefs) (Techera and Chandler, 2015);
- Offshore structures for tourism, leisure, and sports activities (Sommer *et al.*, 2019).

The scenario of leaving in place and reusing obsolete platforms, which leads to value cocreation-oriented activities, has emerged from the data analysis (Fig. 6), including multipurpose uses that combine synergies and compatibilities across platforms. In Italy, multiple sectors coexist in the maritime economy (i.e., commercial fisheries, aquaculture, coastal and maritime tourism, shipping, port activities, oil and gas extraction, and environmental protection). Based on our findings, we consider this multipurpose use a valuable perspective to understand the opportunities of platform decommissioning in Italy and future challenges (Fig. 7).

Fig. 7: A framework of platform multipurpose reuse in light of value cocreation



Source: Authors.

Some of these platforms could become diving bases and strategic sites for the monitoring of the marine environment. Hence, the reuse of facilities could support blue growth initiatives by sustaining growth in the maritime industry as a whole and by harnessing the potential of Europe's oceans, seas, and coasts for the creation of blue jobs and the development of local economies.

In the sustainable reusing of platform equipment, a proactive and innovative solution lies in the development of multi-use platforms at sea (MUPS) that integrate different activities within a specific marine area, for instance, energy production and aquaculture (Vona *et al.*, 2022). The reuse of facilities on multipurpose islands presents several advantages for economic development and ecotourism initiatives (Zawawi *et al.*, 2012). MUPSs are maritime areas that can be designated for a combination of integrated or parallel activities linking spatial (supporting a more sustainable use of marine space) and process efficiency to promote a blue economy in line with recent European strategy and policy (Stuiver *et al.*, 2016; Klinger *et al.*, 2018).

In the MUPS scenario, when platforms are at the end of their service life and become heavy assets whose decommissioning is burdensome from an environmental and economic stand, they could instead become

profitable assets thanks to the application of innovative eco-sustainable strategies in multipurpose use. The platforms represent a high-value asset not only for their existing infrastructures but also for their nontangible features. These may include a strategic location, typically characterised by their proximity to large cities or touristic and cultural landmarks, and access to coastal water or existing infrastructures, as well as proximity to the existing network of social and economic relationships established during the period of plant operation. These nontangible features increase the number of possible end uses or conversion strategies.

Decommissioning programs involve multiple actors with diverse interests and means to achieve decommissioning planning alternatives. Achieving sustainable development requires multisectoral and multidisciplinary approaches. Sustainable decommissioning projects should consider regulatory, environmental, health and safety, and financial criteria to maintain a good reputation for all direct stakeholders involved. To realise fully their contribution potential towards the achievement of the SDGs, government bodies, national authorities, and oil and gas companies should engage in meaningful multistakeholder dialogue with relevant actors locally and nationally, with whom they could identify joint SDG priorities and collectively define potential coordinated responses to the SDGs in the local context. Current regulations do not provide sufficient guidelines on how decommissioning should be carried out to minimise the risk of environmental damage, and they do not foresee potential platform reuse or recycling, which is instead left to the voluntary effort of individual companies. The legislation must provide sufficient incentives to enable reuse projects: reviewing policies and laws for enabling reuse of oil and gas installations is a highly necessary and strategic step for countries with maturing petroleum areas and facing the energy transition.

The authors linked, the literature and their results about the environmental, economic, and social subdimensions that emerged out of their hypothetical scenario of platform leaving in place and reusing. Finally, the authors linked of SDGs relevant in sustainable decommissioning of the oil and gas offshore platforms, as shown in Table 2.

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Tab. 2: Sustainable pillars and SDGs in the scenario of leaving in place and reusing

Sustainable Goal (SDG)	Development	Description	Actions set out in the oil and gas decommissioning program
SDG 3 (Health)		Ensure healthy lives and promote well-being for all at all ages	Oil and gas activities, particularly those in remote or underdeveloped areas, can contribute to health challenges, including indirect impacts due to changes to the local environment and communities. Identifying potential challenges requires understanding the complex social, economic, geographical, and biological dynamics of a given area. Management of decommissioning operations enables mitigation of potential health risks (e.g., exposure to air and water emissions, fires, etc.) Protection strategies for the health of employees and local communities are incorporated in the different stage decommissioning process.
SDG 6 (Water)		Ensure availability and sustainable management of water and sanitation for all	Oil and gas industry manage large land areas and can be responsible for water related ecosystems both within their concession and as part of engaging in landscape-level cross-sectoral management of ecosystems. A water strategy also includes integrated approach with local stakeholder how the oil and gas company protect and restores water-related ecosystems to address water quantity and quality in and around the area of decommissioning operations.
SDG 8 (Sustainable growth)	economic	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all	Foster full and productive local employment and workforce development. Direct employment in oil and gas operations can often be limited, and the local workforce can lack the technical and managerial capacity necessary to meet a company's standards. The incorporation of local businesses into the supply chain, either through the direct procurement of goods and services by the company or through indirect procurement via contractors, contributes to local inclusive economic growth. However, the communication of different stages and economic opportunities of decommissioning project to local communities, educational organizations, and government.
SDG 9 (Industrialization innovation)	and	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Complexity of decommissioning operations requires a high level of technology and expertise and could be promotes inclusive industrialization. Oil and gas industry investing in new technologies that increase energy efficiency and conservation and are low-carbon and climate-resilient in nature. Technological advancements and efficient infrastructure are paths to meeting energy demand while avoiding or reducing environmental and social impacts and related risks. Additionally, by applying innovative and more efficient techniques and for decommissioning program, can improve the environmental and social stewardship of their entire value chain.
SDG 11 (Cities)		Make cities and human settlements inclusive, safe, resilient, and sustainable	Oil and gas industry recognize that its activities can potentially affect the urban environmental, culture and traditions of local communities During the decommissioning process management may also necessitate the implementation of enhanced protect and safeguards, social and cultural plans can be developed, and investments could be made in support of risks connected. During the decommissioning the strategic environmental assessments are implemented to incorporate protect and safeguard cities, and human, cultural heritage into environmental, social and health impact assessments in full compliance with international norms and standards and industry good practice.
SDG 12 (Sustainable consumption and production)		Responsible consumption and production - ensure sustainable consumption and production patterns	Relevant stakeholders involved in decommissioning program (e.g., oil and gas companies, governments bodies, etc.) are helping to meet sustainability challenges by mitigating the impacts and improving the efficiency of their operations and by supporting energy efficiency through a variety of methods. These include implementing sustainability and circular principles in a decommissioning program such as efficient chemical and waste management (recycle materials, reuse facilities, etc.). Coordinate approaches to sustainability thought combined effort of multiple stakeholders is required to improve decommissioning process.
SDG 13 (Climate change)		Take urgent action to combat climate change and its impacts	Climate change may impact a company's infrastructure, assets, operations, and supply chains. To improve the resilience of facilities and local infrastructure need to consider, identifying, and evaluating a wide variety of risks, including those that may be influenced by climate change. Based on those efforts, sustainable decommissioning management strategies can be developed, implemented, and monitored. An enabling policy environment is needed to support the technology innovation, development and deployment needed to transform the energy system and to pursue sustainable development.
SDG 14 (Oceans)		Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Decommissioning operations must support ecosystems and biodiversity. Mitigating potential impacts on the environment in the areas around offshore operations requires integrating local environmental and social considerations into the baseline surveys and environmental impact assessments. Environmental management plans built on those assessments can be implemented to cover an operation's entire life cycle, incorporating each marine ecosystem potentially affected. During decommissioning operations, the established standards and operations integrity, combined with a culture of safety and risk management, are important tools for accident prevention.
SDG 15 (Terrestrial ecosystems)		Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Oil and gas activities affect surrounding environments, the industry manages and mitigates potential impacts through application of the mitigation hierarchy, which emphasizes preventing negative impacts first (avoid, minimize) before considering remediation efforts (restore, offset as a last resort). In decommissioning program need seek opportunities for conservation of the natural environment, it is possible consider biodiversity "offsets" (recreating affected habitats in a new location) for achieve no net loss, and preferably net gain, of biodiversity. Decommissioning option of leave in place and reuse a platform is a useful mechanism for balancing economic development and environmental conservation and can sometimes lead to net conservation gain and help to preserve marine ecosystems, communities, and economies.
SDG 16 (Peaceful and inclusive societies)	and inclusive	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels. Respect the rights of communities potentially affected by decommissioning and avoid conflict that might otherwise arise from a lack of support and participation. To that end, need to ensure timely and responsible management of community queries and concerns, adhering to any formal grievance-handling procedures required by the regulatory authorities.
SDG 17 (means of implementation)		Strengthen the means of implementation and revitalize the global partnership for sustainable development	Energy is a critical pre-condition for achieving the SDGs. In decommissioning program need enhance the global partnership for sustainable development, complemented by multistakeholder partnerships, with stakeholders at global, national, regional, and local levels to achieve the SDGs. Promote effective public, public-private and civil society partnerships, building on the experience and resourcing strategies of partnerships represent an important strategy to determine how to apply the SDG indicator framework in decommissioning program.

Source: Authors.

6. Practical and managerial implications

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Decommissioning encompasses an interdisciplinary agenda that is of interest to many fields in contemporary research and industry. Recently, a sustainable approach to decommissioning has emerged based on principles of safety, circular economy, sustainability, and ecological integrity. This study contributes to the literature and practice. First, it expands the academic and grey literature on sustainability by examining a hypothetical scenario of decommissioning and considering SDG actions. Second, the analysis provides evidence about the perceptions of selected stakeholders (i.e., governments and regulatory authorities, offshore specialists and contractors, trade associations, enterprises and consortia, environmental conservationists, residents and local communities, universities, research centres, and marine scientists) on decommission and the factors influencing practices and value cocreation-oriented activities in the reuse scenario. More importantly, the findings contribute to oil and gas decommissioning practices by providing policy-makers, oil and gas companies, and project managers with information to consider when making decisions about decommissioning programs, stakeholder impacts, and future planning. Third, the study extends the literature on the sustainable life cycle management (SLCM) (Brent *et al.*, 2004; Parente *et al.*, 2006; Sommer *et al.*, 2019; Bull *et al.*, 2019; Basile *et al.*, 2021) by revealing the essential features of oil and gas decommissioning, offering insights about different decommissioning scenarios. Moreover, by unveiling the stakeholders' perspectives, the study shows that considerable attention should be placed on them in decisions about decommissioning and reuse to ensure that, as decommissioning, reuse, planning, and implementation proceed, stakeholders' needs and concerns are properly addressed, thus improving the probability of success. In the end-of-life management of Italian offshore platforms, the adoption of a sustainable perspective and the consideration of the opportunities derived from the application of CE principles can preserve the environment and create new economic and social value (Loia *et al.*, 2021 a,b; Capobianco *et al.*, 2021). In the complex context of platform end-of-life activities management, a circularity approach aims to use resources more efficiently, keep resources in use for as long as possible, and minimise waste. Keeping materials circulating in the economy at as high a value level as possible creates environmental and economic gains. This is particularly relevant to the decommissioning sector, where most of the materials can be recycled, and where national authorities can drive sustainable decommissioning based on reuse and remanufacturing. Therefore, national governments can adopt regulations to drive decommissioning programs towards the leaving in place and reusing of platforms, according to a sustainable and circular vision. In the future, it might be interesting to implement a sustainable business model canvas (SBMC) for offshore platforms where a viable business model is developed that follows a holistic approach that includes all stakeholders and the three dimensions of sustainability (Purnell *et al.*, 2018; Basile and

Vona, 2021). Therefore, in addition to economic criteria, decommissioning programs focus on the ecological and social consequences of the activity and aim at maximising positive externalities and avoiding negative impacts on society and nature. The potential value inherent in leaving in place and reusing structures is significantly higher than that in recycling. The key to sustainable resource management is to develop a decommissioning strategy that involves different stakeholder categories that work together to ensure that the circularity approach is embedded into decommissioning contracts and that consideration is given to innovation and creativity in the reuse of facilities, materials, and energy. The oil and gas industry has the responsibility of raising awareness about concepts related to sustainability in ways that provide energy efficiency as well as contribute to economic and human growth. Organizations such as IPIECA, API, and OGP actively organise sustainable development management standards in the oil and gas sector and encourage oil and gas companies and their shareholders to provide voluntary reports as one of their priorities, thereby consolidating and adhering to sustainable development strategies (Schneider *et al.*, 2013).

7. Limitations and future research

The main limitations of the present work suggest paths for future research and indicate directions that scholars could take to further investigate decommissioning in the oil and gas industry. The first limitation concerns the qualitative approach adopted for investigating the stakeholders' perspectives on the end-of-life management of offshore platforms, which provides preliminary understandings that pave the way for a deeper examination of sustainability questions related to the decommissioning process. The second limitation concerns the sample and the geographical area: the study is focused on Italian stakeholders involved in the decommissioning process. Thus, the research design could be applied in other countries and stakeholder categories could be extended. Analysing other contexts and fields of renewable energies, such as onshore wind farms or bioenergy projects, should enhance the generalizability of our findings. Since the impact of decommissioning decisions and end-of-life management goes beyond the industrial environment, it is essential that industries properly consider the perspectives of distinct stakeholders about different courses of action, which are politically sensitive and multidisciplinary in nature.

Additionally, in line with the objectives of the 2030 Agenda, the interviews with different categories of stakeholders could be repeated and expanded by comparing the latest developments in governmental decommissioning strategies. To explore how the hypothetical scenario of leave in place and reuse integrates the main sustainability pillars, future research could investigate decommissioning options through a more integrative approach, such as a multi-criteria decision analysis (MCDA) including qualitative and quantitative variables. The impacts

of decommissioning alone involve a large number of interest groups in a variety of sectors with conflicting interests (e.g., the fishing industry, the tourism industry, shipping companies, civil society organisations, etc.); thus, the problem is to find a framework to guide the decision-maker to a sound decision: multicriteria methods are particularly suited to this purpose (Kiker *et al.*, 2005; Fowler *et al.*, 2014; Henrion *et al.*, 2015; Na *et al.*, 2017).

Finally, future research could analyse best practices within the sector to share knowledge and experience about using innovative solutions that apply CE principles to reusing, remanufacturing, and recycling waste.

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The impact of autonomy and temporal flexibility on individuals' psychological well-being in remote settings¹

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Abstract

Purpose of the paper: This empirical study investigates the relationship between job autonomy, temporal flexibility and the psychological well-being of employees, as represented by work engagement and job satisfaction, and mediated by work-life balance within a forced remote working context.

Methodology: A quantitative approach was adopted. The data was gathered through a survey administered to 1,550 workers during the lockdown and analyzed through Structural Equation Modelling.

Findings: We show that temporal flexibility and job autonomy enhance the work-life balance of employees and, through the mediation of this construct, positively affect the psychological well-being of employees, measured in terms of work engagement and job satisfaction.

Research limits: The present research presents some limitations from both theoretical and methodological perspectives. Although temporal flexibility directly impacts work-life balance, this relationship could also be examined through the mediating role of job autonomy. The measure scales adopted in the scientific literature were modified in line with the guidelines provided by the investigated organization, thus partially changing their robustness.

Practical implications: Our research also provides useful implications for managers who must tackle the challenges of remote working that emerged during the pandemic and will characterize the new conception of normal after COVID-19.

Originality of the paper: This study is the first to investigate the impact of the only factors related to flexibility that were experienced by employees during lockdown on two components of psychological well-being, i.e. work engagement and job satisfaction, through work-life balance.

Key words: job autonomy; temporal flexibility; work engagement; job satisfaction; boundary theory; well-being; forced remote working

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1. Introduction

COVID-19 forced employees to stay and work at home in the attempt to reduce social contact and contagions, thus dramatically reshaping individuals' lives (Wang *et al.*, 2021), and imposing the adoption of remote working practices (Hu, 2020; Kniffin, 2020). This scenario entailed negative impacts on employees' work-life balance, often generating an intensification of work (Kelliher and Anderson, 2010) that affected their psychological well-being (Prasada *et al.*, 2020). Distress, depression, and anxiety, fuelled by high levels of uncertainty and social isolation, led to a rapid deterioration not only of working conditions (Pirzadeh and Lingard, 2021), but also of individual commitment and performance (Ozcelik and Barsade, 2018).

More specifically, forced remote working has led individuals to experience more integration between their work and family roles. The transition from one social identity to another one generally requires low contrast in roles and permeable and flexible boundaries (Ashforth *et al.*, 2000). Professional and family roles are usually highly differentiated and characterized by few cross-role interruptions (Nippert-Eng, 1996). As a consequence of the integration of these roles, employees may have experienced work-family conflicts, resulting in the risk of no longer being able to properly engage in their own professional roles. During the pandemic, this situation was mainly enabled by the fact that individuals had to perform their professional role in their own home, i.e. the physical environment in which they usually only perform their family role.

Not all employees, however, experienced these negative issues. Several individuals reported some benefits deriving by forced telework (Hu, 2020), e.g. highlighting the extreme reduction in commuting times, safer working environment, and increased time for family and leisure activities (Murmura and Bravi, 2021; Pirzadeh and Lingard, 2021). For instance, a study conducted by Ferdous and colleagues (2021) on 293 employees of an Australian for-profit organization demonstrated that the implementation of flexible practices is positively associated with the well-being and negatively associated with turnover intention of employees thanks to a greater work-life balance.

Which factors discriminate between these two scenarios? This paper aims to answer this question by showing that temporal flexibility and job autonomy enhance the work-life balance of employees and, through the mediation of this construct, positively affect their psychological well-being, measured in terms of work engagement and job satisfaction.

We contribute to organizational behaviour literature in two main ways. First, we highlight how flexible practices may positively influence the psychological well-being of employees through a good balance of work and private life within a forced remote working context. We suggest that temporal flexibility, combined with job autonomy, may mitigate all the issues connected to the integration of roles and the related work—family conflicts that could arise while working at home. On one hand, we suppose that temporal flexibility may decrease the blurring of roles generated by working in the same space in which we live on a daily basis (Ashforth

et al., 2000). On the other hand, we believe that job autonomy may help individuals smoothly transition from a social role to another. Secondly, we demonstrate that the work-life balance generated through these forms of flexibility could lead individuals to higher levels of psychological well-being. Past studies argued that when individuals work from home they may encounter difficulties in engaging in their professional roles as well as being satisfied with their jobs (Rothbard *et al.*, 2005 Ashforth *et al.*, 2000). Our results show that temporal flexibility and job autonomy have helped individuals to handle their social roles, which in turn resulted in achieving better levels of psychological well-being. Finally, we provide suggestions for managers who intend to foster employees' psychological well-being within remote settings by exploring the hedonic and eudaimonic connotation of working activities.

The paper is organized as follows: in the next section, we present some fundamental concepts that were considered in our research and the hypotheses we tested. Then, we describe the methods through which we assessed these hypotheses. In the fifth section, the results are presented to introduce implications for practitioners and academics. Finally, we conclude our paper by highlighting some limitations of our work, together with some suggestions for future research.

2. Theoretical background

2.1 Role transitions and the relevance of work-life balance

By forcing remote working, COVID-19 highlighted the need to better understand how to reconcile professional and personal life. The pandemic forced individuals to work from home, thus pushing them to integrate job and family roles.

Role identities are social constructions that refer to the goals, values, beliefs, norms and interaction styles that are connected to a specific role played by an individual within a group and/or institution (Stryker, 1980). In line with boundary theory (Ashforth *et al.*, 2000), the integration of job and family roles experienced by employees during the pandemic may have generated the blurring of roles and possible work-family conflicts (Rothbard *et al.*, 2005). The low permeability and flexibility characterizing job and family roles may lead individuals to encounter difficulties in handling this situation. The transition of individuals into their professional role within the physical environment that is designated to their family role may have led employees to have encounter difficulties in engaging in their professional roles (Ashforth *et al.*, 2000). At the same time, such difficulties may lead individuals to gain less satisfaction from their job.

In other words, forced remote working has generated a situation in which individuals had to concurrently perform professional and family roles, thus causing potential difficulties in balancing them.

Work-life balance, intended as the ability to balance the work and private spheres, represents one of the main factors that influence job satisfaction (Lookwood, 2003) and has therefore drawn great attention

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from managerial research (see Sirgy and Lee, 2018). This construct has a double definition: one in terms of enriching satisfaction and the other in reducing conflicts. The first is defined as “*achieving satisfying experiences in all life domains, and to do so requires personal resources such as energy, time, and commitment to be well distributed across domains*” (Kirchmeyer, 2000, p. 81). However, a person’s domain is composed of several spheres that might be in conflict if they are not managed properly. As stated by Sirgy and Lee (2018) in fact, work-life balance is “*a high level of engagement in work life as well as nonwork life with minimal conflict between social roles in work and nonwork life*” (p. 232).

Studies have demonstrated that when employees are able to reduce conflicts in their social roles, thus showing high levels of work-life balance, they achieve positive personal outcomes (Sirgy and Lee, 2018). Being engaged in work life is not sufficient. There must be an equal engagement in non-work life (Voydanoff, 2005). On the other hand, role conflict reflects the degree to which role responsibilities in two life domains are incompatible (Greenhaus and Beutell, 1985) and that resources are used to meet the demands of one role at the expense of another (Sirgy and Lee, 2018). Individuals with a high engagement in different life domains experience an augmentation of power, prestige, resources, and emotional gratification from their multiple roles (Sieber, 1974). These roles give a sense of role privileges, overall status security, resources for status enhancement, enrichment of the personality, and ego gratification (Sieber, 1974). Thus, individuals that are highly engaged both in non-work and work life can access resources that are not available to those who are mostly focused on work life (Rozario *et al.* 2004). Individuals who perceive having more control over their work, more schedule flexibility, and more support from their employers, may exert better work-life balance (Kinman and Jones, 2008). Several studies (e.g., Mas-Machuca *et al.*, 2016) confirm this consideration by demonstrating how employee work-life balance is positively related to work engagement (Haar *et al.*, 2014).

Based on the above, we predict that organizational factors, such as employees’ autonomy and time flexibility, may impact work engagement and job satisfaction. However, we also suggest that individual-related psychological factors may influence such relationships, especially in terms of work-life balance, in assuring a positive mental state and psychological well-being in personal and work life. Accordingly, in the following sections, the possible variables influencing this relationship are discussed, together with the main hypotheses building our conceptual framework.

2.1 Flexible work arrangements and temporal flexibility

The introduction of more flexible work arrangements has become an important managerial objective (Deery and Mahony, 1994). Recently, the increase in flexibility at work has been one of the most interesting trends for scientific and managerial practices, which showed that flexibility has a positive impact on the achievement of organizational goals (e.g., as in Beltrán-Martín *et al.*, 2008).

The concept of work flexibility, from a holistic perspective, may be reconducted to the possibility of managing one's own work in terms of space and time (for a review on this, see Kumar *et al.* 2021). More specifically, the literature refers to flexible work arrangements as the “*work options that permit flexibility in terms of where work is completed, often referred to as telecommuting or flexplace, and/or when work is completed, often referred to as flextime or scheduling flexibility*” (Allen *et al.*, 2013, p. 345).

One of the major benefits of flexibility is an increase in work-life balance, since flexible work arrangements enable employees to decide how and where to allocate their time, attention, and energy resources, thus reducing the strain of balancing different life roles (Allen *et al.*, 2013). More specifically, temporal flexibility could refer to the concept of flexible working hours, which includes a series of sub-concepts such as schedule flexibility, flextime, telecommuting, and shift work (Michel *et al.*, 2011). Flextime provides the freedom to manage working hours in relation to employees' personal needs (Baltes *et al.*, 1999). Schedule flexibility, instead, is more based on days off and working days. Among the most widespread forms, agile work (or smart working) is a method of execution of the employment relationship characterized by the absence of time or spatial constraints (Raguseo *et al.* 2016; Neirotti *et al.*, 2019) and an organization of work based on phases, cycles, and objectives that are established by means of an agreement between employees and employers (e.g. as in Mubaroq *et al.*, 2020); coworking is a working style that involves sharing a work environment (e.g., an office) while maintaining independent activity (e.g., as in Amir, 2020); and time flexibility, consisting in the possibility of managing one's working hours independently, allows a fairer and more sustainable distribution of the workload and discourages obsessive work, which is never highly productive (Bal and De Lange, 2015).

Thus, flexible working approaches may allow employees to vary the starting and finishing time of their work day, and choose when to do overtime or take a day off. Both companies and employees can benefit from this practice. Offering temporal flexibility may signal that the organization is supportive of employees' personal needs (Casper and Buffardi, 2004).

This opportunity may create more attractiveness and increase employees' well-being. In fact, organizations that provide temporal flexibility are perceived as more attractive than organizations that do not offer it (Schmoll and Süß, 2019). Flexible working-time arrangements increase job security and flextime policies are likely to provide employees with a greater sense of control (Kossek *et al.*, 2006). This may promote better work-life balance by allowing employees to vary their schedules according to their personal needs (Kossek *et al.*, 2006).

Moreover, previous literature reveals the positive influence of time flexibility on business performance (Bray *et al.*, 2018). Time flexibility positively influences work engagement, productivity (Baltes *et al.*, 1999), job satisfaction and organizational commitment by increasing the work-life balance and helping workers feel more autonomous and valued (MacEachen *et al.*, 2008). Allen *et al.* (2013) highlighted that temporal flexibility is most strongly related to the achievement of work-life balance (Allen *et al.*, 2013) by enabling employees to better manage their other

spheres of interest, reduce the time they spend commuting to and from the workplace, and increase personal productivity.

Nevertheless, some scholars do not consider this kind of flexibility as a direct means to achieve work-life balance, but rather a more an indirect one. More specifically, employees' work-life balance is achieved thanks to the autonomy deriving from the ability to choose when to work, and therefore does not lie in time flexibility itself (Amir, 2000; Clark, 2001; Bohlen and Viveros-Long, 1981). Most of the studies that have focused on the relationship between temporal flexibility and work-life balance have investigated this connection in combination with spatial flexibility (Allen *et al.*, 2000; Allen *et al.*, 2013). We suppose that also during the pandemic, when employees were forced to stay at home and experienced only temporal flexibility, this relationship could have been valid. Thus, we predict that:

H1. Temporal flexibility positively influences individuals' work-life balance in a remote working context.

2.2 Job autonomy

Individuals' autonomy has been recognized as one of the basic human needs and an important driver of intrinsic motivation and well-being (Ryan and Deci, 2000). Autonomy is one of the five core job-related characteristics, together with variety, task identity, task significance, and feedback of work enrichment (Hackman and Oldham, 1975). Job autonomy is characterized by two main aspects. The first concerns the level of autonomy that workers need to control the conditions of their own work, namely operational flexibility (Clark, 2001). This concept also includes the autonomy to decide how work is to be carried out without unnecessary monitoring or restrictions (Bailyn, 1997). The second one concerns the level of autonomy that the company provides to the worker. Accordingly, the literature (Hackman and Oldham, 1975) refers to Autonomy as "*the degree to which the job provides substantial freedom, independence, and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out*" (p. 162).

Job autonomy enables individuals to feel more responsible for both achievements and failures, thus leading them to higher levels of personal satisfaction (Gözükara and Şimsek, 2015). Task autonomy at work and related employees' responsibilities have been long recognized as contributing to the improvement of the performance of both individuals and team and employee satisfaction (Janz *et al.*, 1997). Previous studies have demonstrated that autonomy is able to positively influence individuals' performance, engagement, and job satisfaction (Schwalbe, 1985).

In line with the self-determination theory, when employees have the opportunity to experience more autonomy, they are able to satisfy one of their most important and intrinsic psychological needs, which leads them to feel more satisfaction, motivation and engagement in their work roles. Different studies have demonstrated the positive impact of job autonomy on work-life balance within a work context in which employees could

experience different flexible policies, including spatial and temporal flexibility (Badri *et al.*, 2020; Mas-Machuca *et al.*, 2016).

In this case as well, we suppose that also during the pandemic, when employees were forced to stay home, therefore experiencing only temporal flexibility, job autonomy could positively influence the work-life balance. Based on the above, we hypothesize that:

H2. Job autonomy positively influences individuals' work-life balance in a remote working context.

2.3 Psychological well-being, work engagement and job satisfaction

The topic of employee well-being is becoming increasingly relevant in managerial studies (Grant *et al.*, 2007; Salas Vallina and Alegre, 2018). From a holistic perspective, we can identify three core dimensions of well-being, i.e. physical, psychological, and social (Grant *et al.*, 2007).

During the pandemic, most employees experienced forced remote working, thus reporting elevated psychological distress, depression, and anxiety, which were attributed to feelings of uncertainty about the future and financial concerns. The psychological strains and feelings of social isolation can lead to deteriorating working conditions (Pirzadeh and Lingard, 2021), commitment and performance (Ozcelik and Barsade, 2018). Therefore, in this study we decided to investigate if temporal flexibility and job autonomy were able to mitigate these work challenges and positively influence the psychological well-being of employees through their increase in work-life balance within this forced remote working context.

Psychological well-being is composed by two components: hedonic and eudaimonic (Ryan and Deci, 2001). The hedonic component concerns the subjective experiences of pleasure, or the balance of negative and positive feelings and thoughts. The eudaimonic component concerns the fulfilment of human potential (Grant *et al.*, 2007). Although many previous studies focused mainly on one of these two components, in this study we considered psychological well-being from both perspectives, thus investigating work engagement from a eudaimonic viewpoint and job satisfaction from a hedonic one (Grant *et al.*, 2007).

The first relevant contribution on engagement is attributed to Kahn (1990), who defined it as “*the harnessing of organisation members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances*” (p.18). Thus, an individual's engagement seems to be influenced by features of the job, the people with whom an employee interacts, and the organizational context. Schaufeli *et al.* (2002) conceptualized work engagement as a single separate construct, defining it as “*a positive, fulfilling, work-related state of mind that is characterised by vigour, dedication, and absorption*” (p. 74).

Empirical studies have demonstrated that work engagement enhances the role performance of employees, which entails advantages for both individuals and organizations (Ozyilmaz, 2019; Byrne *et al.*, 2016; Bakker *et al.*, 2012; Rich *et al.* 2010). Furthermore, it has been shown that work

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engagement also has a relevant impact on extra-role performance, such as organizational citizenship behaviour (Rich *et al.* 2010; Zhong *et al.* 2016), as well as on job satisfaction (Haynie *et al.*, 2016).

Few studies have analyzed the relationship between work engagement and remote working, demonstrating that the latter, which is characterized by the use of alternative workplaces and technologies, positively impact work engagement especially by enhancing employees' sense of autonomy, one of the key antecedents of engagement (Griffith *et al.*, 2015). A study conducted by Bal and De Lange (2015) demonstrated that the availability and use of flexible HR practices positively impact WE and performance. Interestingly, recent studies have also shown that emerging new ways of working characterized by temporal and spatial flexibility may positively influence employees' work engagement (Gerards *et al.*, 2018).

Job satisfaction and work engagement are strictly connected. More specifically, job satisfaction refers to "*how an individual feels about his or her job and various aspects of it usually in the sense of how favourable, how positive or negative, those feelings are*" (Rainey, 2009, p. 298). According to Locke (1976), it is a self-reported emotional state deriving from how the individual's needs are fulfilled by the work environment.

Satisfaction depends on several factors such as personality, the influence of society, the situation in the workplace and values, which differ from one individual to another (Locke, 1976). This means that something that may satisfy one employee may not affect - or even dissatisfy - another. However, Johnson (2012) points out that job characteristics are the main source of employee satisfaction.

Job satisfaction is related to various performance indicators. Satisfied workers come to work on time, are more productive, and live happier and healthier lives (Vigan and Giauque, 2016). Moreover, job satisfaction has a positive impact on work engagement. Looking closely at this interaction, according to what was stated by Guglielmi *et al.* (2016), there is a mutual influence between job satisfaction and work engagement. This not only means that job satisfaction may be an outcome of work engagement, but also vice versa. It is also possible that satisfied employees can identify themselves more easily with their job and be strongly committed to their tasks (Guglielmi *et al.*, 2016). Job satisfaction has a positive impact on organizational productivity by reducing absenteeism and turnover (Spector, 1997). A satisfied person is a more successful individual who is able to perform more efficiently, thus achieving the goals of the organization and contributing to its effectiveness (Gorenak *et al.*, 2020). In addition, employees put forth more work effort, are more efficient, and go more to the point when companies offer benefits. The most recognized benefits consist in better opportunities for employees to participate in decisions, greater emphasis on high level skills, more opportunities for training, greater autonomy and a structure that provides workers with incentives, such as performance-related payments (Appelbaum *et al.*, 2000).

Previous studies have demonstrated how work-life balance is able to positively impact on job satisfaction by mainly focusing their attention on the hedonic perspective of psychological well-being (Kossek *et al.*, 2014). These studies were conducted within flexible workplaces in which

employees experienced both temporal and spatial flexibility, which was mediated by the implementation of digital solutions (Kossek *et al.*, 2014).

Given all these considerations, we suggest that the psychological well-being of employees, represented by work engagement and job satisfaction in this study, may be positively predicted by better work-life balance, which in turn is influenced by autonomy and temporal flexibility, the two key elements experienced by employees during the pandemic. Thus, we propose the following hypotheses:

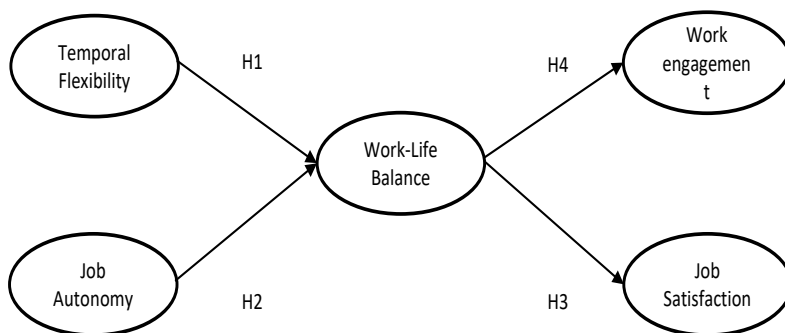
H3. Work-life balance positively influences individuals' work engagement in a remote working context.

H4. Work-life balance positively influences individuals' job satisfaction in a remote working context.

2.4 Model and hypotheses

Considering the predicted hypotheses, the proposed conceptual framework is provided in Figure 1.

Fig. 1: The proposed conceptual framework



Source: our elaboration

3. Methodology

3.1 Research setting, participants, and procedure

The research model was tested using data gathered through a survey that was administrated during October 2020 among the “Vigili del fuoco” (from now on referred to as “VVF”), the Italian institution for fire-fighting and rescuing that implemented remote working practices during the COVID-19 pandemic. We focused on this research setting by acknowledging how, during the time of pandemic healthcare, security and safety operators were most affected by psychological damage due to the stressful situation (Babore *et al.*, 2020).

VVF is a public administration that directly depends on the Ministry of the Interior. The institution is composed by eight central directorates, eighteen regional offices and one hundred provincial commands, with around eight hundred stations throughout the country.

The questionnaire was distributed through an e-mail in which the aim of the research was explained while ensuring employees of the anonymity of the gathered data. This choice was made to protect participant anonymity and reduce evaluation apprehension. The questionnaire was articulated in two parts: the first consisted in questions on demographics (e.g., age, gender, units, etc.) and on whether or not they had experienced remote working. The second part consisted in questions on the investigated constructs, i.e. temporal flexibility, job autonomy, work-life balance, work engagement and job satisfaction.

The questionnaire required approximately 10 minutes to be completed. We gathered a total of 1,550 answers out of 8,325 employees who were involved in the study, thus showing an interesting response rate (19%) and representativeness of the entire population in terms of age and gender. Of course, we only considered the workers who had experienced remote working. The final sample was composed by 793 women (51%) and 757 men (49%), where 49% of the participants were between 50 and 59 years of age. Of this final sample, 1,206 workers (78%) belonged to the management/ logistic unit whereas the remaining 344 workers (22%) belonged to the IT unit.

3.2 Measures and scales

Temporal flexibility was measured by means of two items which had been adapted from the work culture scale developed by Campbell Clark (2001). Such sample items included the following: "I am able to arrive and depart from work when I want to". The participants could answer the items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items were summed to form one index of temporal flexibility, showing good internal consistency (Cronbach's $\alpha = 0.73$).

Job autonomy was measured through three items that had been adapted from Morgeson and Humphrey (2006). Such sample items included the following: "The job gives me considerable opportunity for independence and freedom in how I carry out the work". The participants could answer the items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items were summed to form one index of job autonomy, showing acceptable internal consistency (Cronbach's $\alpha = 0.69$).

Work-life balance was measured using three items that had been adapted from Duraipandian (2014). Such sample items included the following: "I am successful in managing my home and work demands". The participants could answer the items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items were summed to form one index of work-life balance, showing good internal consistency (Cronbach's $\alpha = 0.83$). Work Engagement was measured by means of three items that had been adapted from the Utrecht Work Engagement

scale (UWES; Schaufeli *et al.*, 2002; Schaufeli *et al.*, 2017). Such sample items included the following: “At my work, I feel I am bursting with energy”. Participants could answer the items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items were summed to form one index of work engagement, showing good internal consistency (Cronbach's alpha = 0.74).

Job satisfaction was measured by using four items that had been adapted from the MOAQ scale developed by Camman *et al.* (1979). Such sample items included the following: “The work I do on my job is meaningful to me”. Participants could answer the items using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). All items were summed to form one index of job satisfaction, showing good internal consistency (Cronbach's alpha = 0.78).

In line with previous literature (Breevaart *et al.*, 2014), socio-demographic variables such as gender and age were included as control variables. Data goodness was tested through the goodness-for-fit-test.

3.3 Statistical analysis

First, descriptive statistics were used to show a general overview of the considered constructs through the means, standard deviations, correlations, and frequencies of the analyzed variables.

Second, Structural Equation Modelling (SEM) was used to test the hypotheses and the relationships among the various constructs. All analyses were performed in Stata 14. Additionally, Comparative Fix Index (CFI; Bentler, 1990), the Standardised Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990) were reported to test the model fit. Moreover, the SEM model was chosen in the attempt to test a model that is suitable for studying the relationships between the observed variables and the latent variables (which are constructs that are not observed but derived from the combination of the observed variables, as specified by Babin *et al.*, 2008).

The CFI is considered the best approximation of the population value for a single model, with values that are greater than or equal to 0.90, which is considered indicative of a good fit (Medsker *et al.*, 1994). The SRMR is a standardized summary of the average covariance residuals. A favorable value is less than 0.10 (Kline, 1998). The RMSEA is a measure of the average standardized residual per degree of freedom. A favorable value is less than or equal to 0.08, and values less than or equal to 0.10 are considered “fair” (Browne and Cudeck, 1989).

4. Results

4.1 Descriptive statistics

Table 1 presents the means, standard deviations and correlations of the studied variables. The results indicate that demographic variables (age and gender) are not significantly correlated with the variables investigated

in the study. Temporal flexibility is positively related to job autonomy, work-life balance and work engagement. Results show that job autonomy is positively related to temporal flexibility, work-life balance, work engagement and job satisfaction. Moreover, in considering the work-life balance, results show that it is positively correlated to work engagement and job satisfaction. Furthermore, results show that higher levels of work engagement coincide with higher levels of job satisfaction.

*Tab. 1: Means, standard deviations, inter-correlations and internal consistencies**

	Mean	SD	TF	JA	WLB	WE	JS	Gender	Age
Temporal flexibility	3,96	1,07	(.73)*						
Job autonomy	3,93	0,78	0.5565**	(.69) *					
Work-life balance	3,96	0,93	0.3391**	0.4280**	(.83) *				
Work engagement	3,86	0,81	0.2186**	0.3926**	0.2576**	(.74) *			
Job satisfaction	4,14	0,78	0.1966**	0.3362**	0.2407**	0.7029**	(.78) *		
Gender	1,51	0,50	-0.0319	-0.0196	0.0282	0.0065	0.0122		
Age	3,32	0,86	-0.0266	0.0171	0.0299	-0.0273	-0.0408	-0.0787**	

Note. ** = Significant at $p < 0.05$

4.2 Confirmatory Factor Analysis

We considered five nested models with various numbers of factors. In particular, we considered: (a) a single factor model that incorporates all five constructs; (b) a two-factor model combining temporal flexibility and job autonomy (factor 1), work-life balance, work engagement and job satisfaction (factor 2); (c) a three-factor model combining temporal flexibility and job autonomy (factor 1), work-life balance (factor 2) and work engagement and job satisfaction (factor 3); (d) a four-factor model that combines temporal flexibility and job autonomy and, lastly, (e) a model that considers each construct as a separate factor.

The fit indexes of the models are presented in Table 2 and confirm that the five factors model is the one with the best good fit (for all indexes). Thus, it is the best approach as concerns the measurement part of our model. The factor loadings of all items were significant at $p < 0.01$.

Tab. 2: Results of the confirmatory factor analysis

Model	CFI	TLI	RAMSEA	SRMR	χ^2	df	Difference
1 factor	0.527	0.447	0.196	0.143	6278	91	—
2 factors	0.592	0.524	0.182	0.164	5361	103	916.998*
3 factors	0.919	0.904	0.082	0.68	1143	101	4218.295*
4 factors	0.909	0.890	0.087	0.119	1269	99	-125.683*
5 factors	0.965	0.952	0.058	0.54	504	88	764.572*

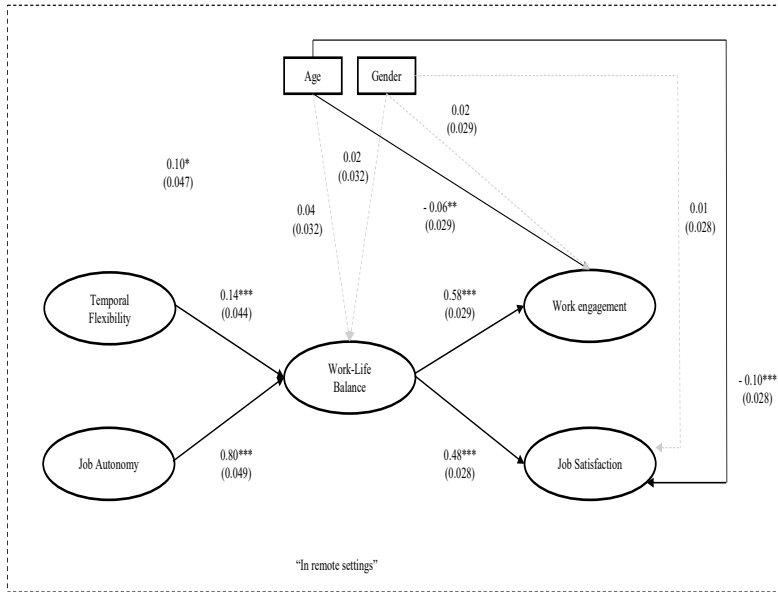
Note. CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR= Standardised Root Mean Squared Residual; Difference = difference in chi-square between the consecutive models; * = Significant at $p < 0.01$

4.3 Path analysis

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Figure 2 shows the structural model of the relationship among the various constructs. The hypothesized model showed a good fit to the data ($\chi^2(109) = 533.216$, CFI = 0.967, SRMR = 0.043 and RMSEA = 0.050).

Fig. 2: SEM results of the hypothesized conceptual model



Notes: Standardised coefficients are reported, with standard errors in the parentheses. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

The results indicate that temporal flexibility is significantly and positively related to work-life balance ($\beta = 0.14$, $p < 0.01$). Furthermore, the model indicates that job autonomy significantly and positively affects work-life balance ($\beta = 0.80$, $p < 0.01$). Moreover, work-life balance significantly and positively impacts work engagement ($\beta = 0.58$, $p < 0.01$) and job satisfaction ($\beta = 0.48$, $p < 0.01$). As for the control variables, age slightly and negatively impacts work engagement ($\beta = -0.06$, $p < 0.05$) and negatively impacts job satisfaction ($\beta = -0.10$, $p < 0.01$), thus having an insignificant impact on work-life balance ($\beta = 0.04$).

Finally, gender has an insignificant impact respectively on work-life balance, work engagement, and job satisfaction ($\beta = 0.02$, $\beta = 0.02$, $\beta = 0.01$).

Table 3 shows that the indirect effects of temporal flexibility and job autonomy on work engagement and job satisfaction through work-life balance are significant. These results suggest that work-life balance partially mediated the relationships between temporal flexibility, job autonomy, work engagement and job satisfaction.

Tab. 3: Significance testing of indirect effect. Sobel Test

	Indirect effect	St. Er.	z-value	p-value	Conf. interval
TF → WLB → WE	0.032*	0.011	3.066	0.002	0.012 – 0.053
TF → WLB → JS	0.060*	0.019	3.093	0.002	0.022 – 0.098
JA → WLB → WE	0.252*	0.029	8.767	0.000	0.196 – 0.311
JA → WLB → JS	0.471*	0.050	9.479	0.000	0.374 – 0.572

Note. St. Er = Standard error; Conf. Interval = Confidence interval * = Significant at $p < 0.01$

5. General discussion

This paper deepens knowledge on the effects of some worker-related variables on work-life balance. By considering remote working habits, we shed light on possible variables influencing individuals' work-life balance. More specifically, we investigated the role of temporal flexibility and job autonomy in influencing individuals' work-life balance, together with the effects of job satisfaction and work engagement. We thus contribute to improve knowledge on organizational behaviour, work psychology research and management literature in several ways.

Firstly, our study not only confirmed that job autonomy positively affects individuals' work-life balance (as demonstrated by Hackman and Oldham, 2005), but also that this relationship holds true even in a forced remote working context. Despite the fact that forced remote working might generate several issues in handling employees' private and job lives, job autonomy has led employees to perceive a better balance between the two domains. In line with boundary theory (Ashforth *et al.*, 2000), we suppose that job autonomy may have helped individuals transition from a family to a professional role, thus mitigating possible interferences deriving from the integration of both social roles.

Second, this research highlights the positive impact of temporal flexibility on the work-life balance. Although some authors have demonstrated the indirect influence of temporal flexibility in the past (Bohen and Viveros-Long's, 1981; Campbell Clark, 2001), our results highlighted its direct impact on work life balance. As discussed in the introduction, the pandemic imposed the adoption of remote working practices (Hu, 2020; Kniffin, 2020) and forced employees to work at home, thus compelling them to completely re-configure their lives (Wanget *al.*, 2021). Individuals that had not experienced such remote working practices before that period may especially suffer boundary management related to private and job roles. We believe that temporal flexibility may have mitigated the role-blurring that was generated by working in the physical environment in which individuals usually only perform their family role. In other words, if spatial flexibility leads employees to manage their boundary roles, temporal flexibility may help them create routines and moments in which they transition from a social to another role.

Third, while previous studies have demonstrated that the work-life balance may positively influence job satisfaction (Haar *et al.*, 2014; Carlson *et al.*, 2009) by mainly focusing their attention on the hedonic perspective of psychological well-being, this study showed that the work-life balance

can positively also affect employees' engagement, thus producing an impact from an eudemonic perspective (Grant *et al.*, 2007). Our study investigated the psychological well-being of employees as a multidimensional concept composed by two dimensions represented by work engagement and job satisfaction. By means of these two dimensions, we studied the effects of the identified variables through two different perspectives (eudaimonic and hedonic), thus offering a more omni-comprehensive vision on psychological well-being.

Our findings are in line with theory of self-determination (Ryan and Deci, 2000) and jobdemands-resources model (Demerouti *et al.*, 2001). Through job autonomy, individuals may satisfy their psychological needs of autonomy and competence which, in turn, produce positive effects on work engagement and satisfaction. Furthermore, temporal flexibility can be considered a resource that is provided by the organization to mitigate physical and psychological costs related to forced remote working. This positive impact could be explained by considering that flexibility usually permits employees to satisfy their basic psychological need of autonomy (Ryan and Deci, 2000).

Summarising, although the pandemic produced negative impacts on employees' work-life balance by generating an intensification of work, stress, depression, and anxiety (Kelliher and Anderson, 2010; Prasada *et al.*, 2020; Pirzadeh and Lingard, 2021), our research has demonstrated that temporal flexibility and autonomy can help individuals manage their professional and private lives in order to react positively to the related distresses.

Finally, our results also highlighted that age slightly and negatively impacts both work engagement and job satisfaction. These findings are interesting if we consider the forced remote working that was experienced during the pandemic. It is possible to hypothesize that older generations are less familiar with flexible practices and inclined to separate their private and work lives (Guido *et al.*, 2021). Our research also provides useful implications for managers in suggesting new organizational strategies and recommending how to deal with the remote working challenges that emerged during the pandemic that will characterize the new normal after COVID-19 (Wang *et al.*, 2021). Managers should encourage time-based flexible work arrangements, granting autonomy and empowering to attain accountability over results, as specified by research on smart working (Raguseo *et al.*, 2016; Neirotti *et al.*, 20219, Langé and Gastaldi, 2020).

If, on the one hand, managers should continue to protect the psycho-physical and social health of their workers, on the other hand, they are called to proactively participate in the integrated management of business risk, and to feel more empowered in their activities. This decision-making autonomy may impact not only employees' psychological well-being but also enable them to perceive greater and empowering responsibility from the company. In this sense, greater temporal flexibility and autonomy increase their psychological well-being, also based on a renewed balance between personal and working life that is capable of positively impacting companies' performance by virtue of greater job satisfaction and empowerment.

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Our study is not devoid of limitations. First, while the direct and separate investigation of temporal flexibility and job autonomy could represent a strong point, the relationship between temporal flexibility and work-life balance could also be examined through the mediating role of job autonomy. Future studies could investigate the threefold impact of temporal, spatial flexibility and job autonomy on the psychological well-being of employees in a hybrid working context in which employees can truly have the freedom to choose when, where, and how work. From a methodological viewpoint, the used items have been modified and reviewed to ensure they were in line with the guidelines provided by the investigated organization. This process could have partially changed the robustness of some of the measure scales that were adopted from the scientific literature.

Further studies could demonstrate the impact of remote working practices on life satisfaction (Pavot and Diener, 2008) which, from a holistic perspective, is referred to individuals' satisfaction toward their life, and not just the balance between work and leisure time. In addition, by considering workers internal "consumers" of firms (Arnett *et al.*, 2002), future studies could investigate important individual-related characteristics, such as their search for status (Eastman *et al.*, 1999).

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Useful information for readers and authors

What is the positioning of Sinergie Italian Journal of Management?

Sinergie Italian Journal of Management, the official journal of the Società Italiana di Management (SIMA-the Italian Society of Management), is a peer-reviewed scholarly publication that presents leading research across all business and management areas and focuses on the main trends and boundary-pushing ideas in management studies.

What is this journal's topic coverage?

The journal has a broad thematic profile and covers various areas in the business and management field, such as strategic management, corporate governance, entrepreneurship, international business, sustainability, small and family business, operations and supply chains, strategic communication, marketing, retailing and service management, innovation and technology management, tourism and culture management and, of course, business ethics and general management.

What is "Italian" in Sinergie Italian Journal of Management?

This journal aims both to bring the Italian management perspective to the international debate and to encourage scholars worldwide to contribute through an innovative approach on topics relevant to the sound conduct of businesses and other organisations. The journal's keywords include, but are not limited to, management applications specially relevant to the Italian economy and other mature economies, such as manufacturing, creativity, sustainability, open innovation, digital transformation, entrepreneurship in small and medium-sized enterprises, family business, networks, alliances and territorial ecosystems, innovative value proposals and circular business models, as well as to the management of specific businesses, such as food, fashion, furniture, industrial equipment, art, culture, tourism, design and luxury.

How broad is the scope of this journal?

Sinergie Italian Journal of Management aims to balance relevance with methodological rigour and encourages interpretation, reasoning and critical, context-aware discussion about phenomena and their managerial implications. Narrow discussions focussed only on highly specific sub-fields will be regarded as non-priority.

Which research approach does this journal welcome?

The journal is open to different research approaches and welcomes both conceptual and empirical contributions that employ a qualitative, quantitative or mixed methods research approach. It also accepts case

studies, provided the analysis is adequate. Review articles that move beyond description to propose critical reflection and sound theoretical contributions are also welcome.

Issues frequency and coverage

When is the journal published during the year and are special issues part of the editorial planning?

The journal is published every quarter. It welcomes both the submission of manuscripts to be published in its regular issues and of manuscripts to be published in special issues edited by guest editors. Special thematic issues have always been a prominent feature of Sinergie Italian Journal of Management. Currently, the Editors are encouraging the development of special issues on relevant management themes that fit the journal's scope.

Principles and vision

What principles drive the conduct of this journal?

A few fundamental principles drive the conduct of Sinergie Italian Journal of Management:

- **Relevance:** The journal values the usefulness of research to improving management practice and to addressing business challenges and socially relevant issues.
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What vision has inspired the development of this journal?

Connections between research, ethics, creative thinking and managerial action are the foundational premises on which to build a future based on the common good.

How is journal content quality assured?

Sinergie is a double-blind reviewed journal.

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- acceptance subject to substantial modifications
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Reviewers apply the following criteria when assessing submissions:

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2. relevance of the primary and secondary data sources and of the references
3. clarity of expression
4. originality/innovation
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- risultati
- limiti della ricerca
- implicazioni manageriali
- originalità del paper

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