



Organisational transformation toward circular economy in SMEs. The effect of internal barriers

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ABSTRACT

This study investigates the dynamic process of circular economy (CE) implementation in small and medium enterprises (SMEs). We draw on an integrated theoretical framework that combines environmental literature and strategic orientation to explore the interplay between barriers, organisational transformation, and different stages of CE integration. Through a comprehensive empirical analysis, based on an EU database of 16,365 SMEs, we confirm the presence of feasibility barriers and resource related barriers that affect the CE implementation process. Our findings reveal a twofold pattern: initial feasibility barriers, primarily perceived by senior managers, and subsequent resource-related barriers that SMEs encounter during implementation. Moreover, our findings reveal that successful organisational transformation pivots on the SME's capacity to transform these barriers from deterrents into challenges to be overcome. We highlight the significance of a gradual integration approach, emphasizing the role of diverse environmental activities.

1. Introduction

Since the last decade, circular economy (CE) has become an important and interesting line of research, showing a new perspective on production, and waste and resource management (Arranz et al., 2022; Bocken and Konietzko, 2022; Fernandez de Arroyabe et al., 2021). CE research has had important antecedents, building on previous work on sustainability, industrial ecology, eco-design, cleaner production, eco-innovation, closed economy, and ecological loops, among others (De Jesus and Mendonça, 2018). For firms, CE implies the transforming production, supply chains and linear models to circular ones, transforming waste and excess resources into new materials and products (Blomsma and Brennan, 2017). In fact, CE should be a business and corporate objective, replacing the linear economic model, summarized in a system of “take, make, use, discard”, in a circular model (Fernandez de Arroyabe et al., 2021; Kirchherr et al., 2017).

In this research, we will focus on small and medium enterprises (SMEs), considering their substantial contribution to economic development, representing around 90% of businesses worldwide and over 50% of global employment (World Bank Finance, 2021). SMEs are adopting sustainable practices such as circular economy, which offer

them advantages such as cost savings, resource efficiency, and market differentiation (Tura et al., 2019). CE reduces operational costs by optimizing resource use and minimizing waste generation through recycling and remanufacturing. Moreover, these practices attract environmentally conscious consumers and open up new business opportunities (Dey et al., 2022). Compliance with environmental regulations and fostering innovation are also benefits of circular economy for SMEs. In summary, adopting circular practices offers numerous benefits for SMEs, from cost savings and market differentiation to innovation and environmental compliance, creating value, reduce environmental impacts, and contribute to a more sustainable and prosperous future.

Despite the importance of implementing circular economy practices for SMEs, the current business reality shows that only a limited percentage of products and materials are recycled, and even fewer are reused, restored, or repaired (Morseletto, 2020; Tura et al., 2019; Lüdeke-Freund et al., 2019). For example, Dey et al. (2022) emphasize that 80% of SMEs aim to implement additional ethical and sustainable practices. Conversely, Malesios et al. (2018) indicate that 40% find sustainable practices too expensive to adopt. In this line, research acknowledges that the size of a company significantly influences the extent sustainability measures, typically resulting in smaller firms participating

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in fewer environmental activities (Brammer and Pavelin, 2008). Bassi and Dias (2020) have suggested that the decision to favour circular economy behaviour is closely tied to a company's scope, including employee numbers and turnover rates. Moreover, despite the availability and significance of EC for the SMEs, their implementation is often slow, indicating a notable gap between intention and effective action (Ellen MacArthur Foundation, 2015; Mendoza et al., 2017). Bocken and Geradts (2020) underscore the challenges in transitioning from intention to implementation, highlighting a significant gap in how SMEs translate intention into decision and subsequent action.

In this paper, we address the gap between intention and effective action to implement CE practices in SMEs. This research question is crucial given that SMEs have a substantial environmental impact, contributing approximately 60%–70% of industrial pollution in Europe, particularly in manufacturing (OECD, 2018a, 2018b). For example, Dey et al. (2022) point out that manufacturing SMEs alone are responsible for 64% of air pollution, yet only a small fraction (0.4%) have environmental management programs in place. In this investigation, we will use the EU database (Flash Eurobarometer 486, 2020), which includes 16,365 SMEs. We empirically test our hypotheses employing Ordinal Logistic Regressions. Moreover, we utilize the strategic orientation perspective as our theoretical framework. (Narver and Slater, 1990). This framework allows us to conceptualize CE as a strategic orientation. The strategic orientation of the company guides appropriate behaviours, and emphasizes the development of resources and capabilities necessary for the development of organizational transformations, for the effective implementation of the CE strategic orientation (Ferrell et al., 2010; Ardito et al., 2021). Moreover, we assume that the implementation of the strategic orientation will depend on the company's ability to address the barriers and obstacles encountered in the organizational transformation process, assuming the conceptualization of D'Este et al. (2012) between revealed and deterrent barriers.

More in detail, firstly, we propose a *multi-stage approach to implementing* CE, examining how barriers impact the organizational transformation process of SMEs from intention to implementation. Two types of barriers are considered: *feasibility barriers*, where senior managers assess the viability of CE strategic orientation in SMEs, and *resource and capability barriers* for implementing CE strategic orientation. Unlike prior studies (Dey et al., 2022; Tura et al., 2019), we emphasize the crucial role of senior managers in SME decision-making and recognize CE implementation as an organizational transformation process. While the literature has highlighted advantages such as the owner-manager concept and informal relationship and communication processes in SMEs, facilitating the use of informal sustainability practices (Russo and Tencati, 2009); however, we highlight how senior managers and resource constraints serve as primary internal barriers to EC implementation in SMEs.

Secondly, we postulate that the *degree of organizational transformation* is variable depending on the *degree of integration* of the CE strategic orientation. Following Pieroni et al. (2019), the implementation of CE involves the combination of various environmental activities, such as recycling or reusing materials, reducing consumption, saving energy, and developing sustainable products or services. Our model proposes that the firms assume the integration process as a gradual process, where the companies develop the various environmental activities, until a full integration of the CE model. Consequently, we argue that depending on the perception of SME of the barriers obstacles, we can find a variability in the degree of CE integration.

2. Conceptual framework

2.1. Strategic orientations, organisational transformation and barriers

The strategic orientation of the company reflects the strategic directions implemented by a company, creating appropriate behaviours and performances (Narver and Slater, 1990). From a strategic point of

view, the strategic orientations assume that firms allocate resources and capabilities for their implementation (Ferrell et al., 2010; Ardito et al., 2021), implying a process of organizational transformation in firms (Ferrell et al., 2010). In this sense, organizational transformation supposes a process of gradual and systematic change of the firms in their corporate culture and organizational structure. Firms in the process of organizational transformation face challenges and barriers (Bojesson and Fundin, 2021; Bocken and Geradts, 2020; D'Este et al., 2012), which can lead some firms to be dissuaded from getting involved in the organizational transformation, remaining in the already established organizational routines.

In this paper, we will follow the conceptualization of D'Este et al. (2012), which identifies two types of barriers: *deterrent and revealed barriers*. Deterrent barriers, as inducers of dissuasive effects, come from different streams of literature in the fields of innovation management and industrial organization. Firms experience barriers as result of resistance to adjust competencies and organizational practices (Bojesson and Fundin, 2021; Bocken and Geradts, 2020). For example, organizational inertia and structuring routines can limit the ability of firms to develop a strategic orientation. Obstacles can also come from the lack of resources and capacities, given the lack of knowledge and organizational skills or experience in the technologies used (D'Este et al., 2012; Mohnen and Röller, 2005; Galia and Legros, 2004). In contrast to the revealed barriers, firms encounter this type of barriers in their organizational transformation process. In this case, these barriers do not have a dissuasive character, but the firms, through learning and experience, are capable of overcoming these obstacles (D'Este et al., 2012; Altomonte et al., 2016).

Strategic orientation in SMEs refers to the approach and mind-set adopted by SMEs to establish and achieve their business objectives (Pett et al., 2019; Kumar et al., 2012). While SMEs may have varying strategic orientations depending on factors such as industry, market dynamics, and organizational culture, several common strategies can be observed. Overall, the strategic orientation involved by SMEs can significantly influence their competitiveness, growth prospects, and long-term success in the market (Pett et al., 2019). SMEs must carefully consider their strategic orientation and align it with their organizational capabilities, resources, and market opportunities to effectively address competitive challenges and achieve sustainable growth (Park and Seo, 2018). By doing so, SMEs can enhance their resilience, adaptability, and overall performance in today's dynamic business environment.

2.2. Circular economy: a strategic orientation in the SME

Traditionally, academics have explored three dimensions of strategic orientation: market, technological or business orientation (Zhou et al., 2005; Narver and Slater, 1990). More recently, an additional dimension, environmental orientation, has been conceptualized to reflect the strategic decision to integrate sustainability and environmental practices into the activities of firms (Ardito et al., 2021).

In this context, we assume the CE as a strategic orientation of the company towards sustainability. The circular economy is conceptualized as an economic model for closed-loop production and consumption systems (Pieroni et al., 2019; Bocken and Konietzko, 2022; Fernandez de Arroyabe et al., 2021). Unlike the classic linear production models, the circular economy model is based on the maintenance, reuse, remanufacturing and recycling of the broad cycling of material flows product. Thus, the circular economy is presented as a system for the use of resources where recycling or reusing materials prevails; the reduction of consumption and especially of natural resources; develop new products and services compatible with the environment; and encourage energy savings in production processes (Kuhlmann et al., 2023; Bocken and Konietzko, 2022; Pieroni et al., 2019).

In this context, the adoption of the CE model generates important organizational transformations for companies (De Jesus and Mendonça, 2018; Eikelenboom and de Jong, 2022). The CE requires essential

changes in production and consumption patterns, promoting eco-innovative development, and establishing cooperation agreements, both within the supply chain and with other agents (Fernandez de Arroyabe et al., 2021). De Jesus and Mendonça (2018) point out companies must overcome a series of barriers in the organizational transformation towards CE. Examples of these are cultural, regulatory, market, and technological barriers, among others (Bocken et al., 2023).

CE orientation in SMEs involves integrating circular economy principles into their operations, products, and services (Schmidt et al., 2021). SMEs focus on resource efficiency, minimizing waste generation, and optimizing material use. They adopt design-for-circularity principles, creating durable, repairable, and recyclable products. SMEs attempt to develop closed-loop supply chains, collaborating with stakeholders to implement reverse logistics and product recovery processes (Ormazabal et al., 2018). Collaboration and partnerships with other businesses, research institutions, and government agencies facilitate knowledge sharing and scaling up circular solutions. Embracing a circular economy orientation enables SMEs to achieve cost savings, resource efficiency, market differentiation, and resilience to environmental risks (Mura et al., 2020). Their role in driving the transition to a circular economy is crucial due to their significant presence in the global economy and their ability to innovate and implement sustainable practices at the local level.

3. Hypotheses

3.1. The effect of barriers in the CE implementation stages of SMEs

Our research model suggests that the implementation of CE orientation and its consequent organizational transformation occurs in SMEs if they are capable of overcoming the obstacles and barriers in this process. We propose various stages in the implementation of CE in SMEs, from SMEs that are in the first stage, where SMEs have not started the implementation, SMEs intending to develop the CE, or SMEs that have decided to implement the CE organisational transformation, and finally, SMEs that have already implemented it. In this implementation process, we consider two types of obstacles. The first is a preliminary barrier where the feasibility to implement Circular Economy (CE) is assessed. The second consists of barriers encountered during the process development, stemming from the requirement to possess resources and capabilities for the implementation of CE.

Firstly, with respect to the obstacles and barriers that arise from the feasibility of implementing CE, the existing literature has already pointed out that these obstacles act as catalysts for processes of organizational change (Hina et al., 2022; Asgari and Asgari, 2021; Sarja et al., 2021). In other words, organizations assess the compatibility of the strategic orientation with the current business model, the potential profitability of the orientation, and the presence of a market prior to making decisions (Frambach et al., 2016; Matsuno and Mentzer, 2000). In this context, it is essential to consider the role played by senior managers within SMEs, particularly when evaluating the feasibility of implementing a CE strategic orientation. Previous literature focusing on SMEs has underscored the influence exerted by senior managers on the strategic choices made by SMEs (Bauweraerts et al., 2022; Schwens et al., 2011; Moreno and Casillas, 2008). Moreover, in alignment with Staw's perspective (1991), we assume that organizational actions essentially manifest as individual behaviours, where the decisions of SMEs are, in essence, individual decisions made by managers. Furthermore, theorists specializing in self-determination theory posit that self-efficacy, confidence in one's capabilities, control over the situation, and previous experiences are factors that influence such proactive behaviours (Ryan and Deci, 2000; Gagné and Deci, 2005). In this context, the integration of the strategic orientation by the manager hinges upon varying degrees of confidence, situational control, and self-efficacy, which, consequently, shape the manager's proactive involvement (Ryan and Deci, 2000; Gagné and Deci, 2005). As a result, the manager

will assess the feasibility of implementing the CE orientation, progressing through subsequent stages (intention, decision, and implementation) as they deem the implementation of the CE orientation to be feasible within the SME.

Secondly, the implementation model is regarded as a process wherein SMEs cross stages from intention to decision and the implementation of CE orientation. Already the literature points out the firms encounter barriers that stem from the endeavour to implement the strategic orientation towards CE (Fernandez de Arroyabe; Mathews et al., 2018). Following D'Este et al. (2012), and Galia and Legros (2004), this is particularly important due to the potential absence of knowledge, organizational skills, or experience in the technologies utilized, all of which are required for effectively integrating the CE model within the organization. Throughout this implementation process of the strategic orientation, SMEs must possess not only managerial skills and financial resources but also the necessary capabilities. Moreover, Authors consider that the inertial tendencies within SMEs and the existing structured routines, or lack resources and capabilities, may not be inherently dissuasive. Consequently, in line with innovation theory and drawing from D'Este's insights (2012), which suggest that the implementation of an innovation process can be understood as a transition from deterrent barriers to revealed barriers, we contend that the process of implementing CE orientation will advance if such a transformation takes place. Through learning and experience, firms are capable of surmounting these obstacles, thereby enabling them to persist in the process of organizational transformation.

Therefore, we posit that during the process of implementing CE orientation, SMEs confront two categories of obstacles and barriers. The first category represents a preliminary stage wherein the senior manager of the SME encounters the barrier of CE orientation feasibility in the implementation process. If the SME perceives CE implementation as viable, it will proceed to subsequent phases, namely intention and decision, with the perception of barriers diminishing in a decreasing manner as progress is made in the implementation process. The second group of obstacles emerges during the implementation process, as SMEs begin to discover the requirements for resources and competencies necessary for successful implementation. In this scenario, the relationship between CE orientation implementation takes on a U-shaped curve. Initially, with null intention, barriers might not be perceived; however, as the process advances, SMEs encounter barriers and obstacles. Consequently, SMEs perceive these obstacles in an increasing manner, which decreases as stages are overcome, and resources and capabilities are acquired through learning and experience within this process. Hence, we propose the following hypotheses, combining the various implementation stages of CE orientation, and the barriers in this process. Hence, we propose.

Hypothesis 1a. The feasibility barriers have a decreasing relation with the implementation stages of CE in SMEs.

Hypothesis 1b. The resources and capabilities barriers have a U-inverted shape relation with the implementation stages of CE in SMEs

3.2. The effect of barriers in the degree of CE organizational transformation of SMEs

This second group of hypotheses proposes that the integration of CE orientation may have a variability in the degree of organizational transformation in the SME. In accordance with the Pieroni's perspective (Pieroni et al., 2019), the implementation of CE entails the join up of diverse environmental activities, encompassing actions like recycling or reusing materials, reducing consumption, saving energy, and developing sustainable products or services. Our model posits that firms embrace the integration process as gradual organisational transformation, where companies progressively integrate the array of environmental activities until achieving the integration of the CE. Thus, we propose that this degree of organizational transformation will be affected by the ability of

SMEs to face the barriers of this process. Previous literature points out that the integration of strategic orientation points requires resources and skills for the organization, which can be in competition with previous orientations in the organization for the resources (Ardito et al., 2021). Moeuf et al. (2018), and Ardito et al. (2021) argue the integration the new orientations, based on the fact that the knowledge, relational and human resources necessary to implement strategic orientation is different and address different objectives, being especially critical for SMEs as consequence of the limited level of resources.

First, SMEs have a limited number of employees, so following a new CE orientation can expose employees to a variety of tasks and skills. Therefore, this situation can be described as a *learning paradox*, where the variety of knowledge can be difficult to absorb and assimilate, and employees may be committed to dedicating the necessary effort and time to diverse activities and in distant opportunities (Ardito et al., 2021; Ocasio, 1997). This can produce a paradoxical situation, where the integration of the CE orientation depends on the learning capacity of the organization, being able to find that high levels of integration of CE generate a dispersion of the learning capabilities and performance of the employees of SMEs, resulting in weaker integration of the CE orientation. Second, the integration of new orientations can produce a paradoxical *organizational situation*, as a result of managers having to face too many competing tasks and objectives (Kim et al., 2016). The integration of new orientation can produce a paradoxical organizational situation, as result of managers having to face too many very specific tasks and competing objectives. In this sense, Ocasio (1997), introduces the attention distribution problem, arguing that attention is a limited resource and that managers need to concentrate their energy, effort and full attention on a limited number of topics to achieve performance. Moreover, Ardito et al. (2021) point out that this problem is aggravated in the case of SMEs, that managers do not usually delegate the implementation of a strategy and will probably be overwhelmed by the complexity of integrating both strategies and combining resources, identifying the probability of generating conflict situations, as a consequence of internal tensions and misunderstandings that hinder the effective implementation of processes that include both orientations, especially in the context of SMEs, characterized by financial and human resource limitations.

Therefore, stemming from these paradoxical scenarios, we conceive the CE integration process as a dynamic progression, characterized by an escalating level of integration and organizational transformation. As this degree of integration and transformation intensifies, it necessitates intensified resources and skill sets from employees, potentially manifesting as an ascending obstacle. Furthermore, parallel to the deepening degree of integration and organizational transformation, managers find themselves compelled to allocate more attention to CE integration. In the context of limited time and resources, this intensified focus may inadvertently amplify the perception of barriers and obstacles regarding the feasibility of CE orientation. However, aligned with our preceding hypothesis, should the SME effectively navigate this organizational transformation, transforming these barriers from deterrents into challenges to be overcome, it will advance in both the integration and digital transformation processes. This advancement will consequently diminish the perception of obstacles in the CE orientation integration within the SME. Therefore, we propose the following hypotheses.

Hypothesis 2a. In the CE organisational transformation process, the resources and capabilities barriers have a U-inverted relation with the level of integration of the CE model in SMEs.

Hypothesis 2b. In the CE organisational transformation process, the feasibility barriers have a U-inverted relation with the level of integration of the CE model in SMEs.

4. Methodological approach

4.1. Database

To test empirically the hypotheses, we use the database from Eurostat, Flash Eurobarometer No. 486, which is conducted for the European Commission (European Commission, 2020). The survey on *SMEs, start-ups, scale-ups and entrepreneurship* was conducted in the EU27 and an additional 12 non-EU countries and territories and focuses on the barriers and challenges that SMEs in Europe face when growing, transitioning to more sustainable business models and digitisation. The survey collected responses from more than 16,000 telephone interviews with enterprises employing one or more persons between 19th February and May 5, 2020. Interviews were conducted by phone in their respective national language, getting a final sample of 16,365 SMEs.

Regarding the distribution based on size, we see that 62% of the companies are microenterprises (1–9 employees), 22.5% are small companies (10–49 employees), and finally, 15.5% are medium-sized companies (50–249 employees). Regarding the sectoral distribution, the companies are included in 16 business sectors, corresponding to manufacturing at 19.5%, retail firms at 27.7% and Scientific and Technical activities at 9.3%. The sample data covers a geographical scope of 39 countries (27 European countries and 12 non-EU) (Table 1). Moreover, in Table 2, we present the distribution by country.

4.2. Measures

The first dependent variable measures the level of circular economy implementation (*CE degree*). Following Pieroni et al. (2019), we consider CE implementation as the comprehensive execution of recycling or reusing materials, reducing consumption's impact on natural resources, conserving energy or transitioning to sustainable energy sources, and crafting sustainable products or services. The question includes the following multi-item options: i) Recycling or reusing materials; ii) Reducing consumption of or impact on natural resources (e.g. saving water or switching to sustainable resources); iii) Saving energy or switching to sustainable energy sources; and iv) Developing sustainable products or services. This variable is formulated as a cumulative index encompassing the four environmental activities. Its value is zero when firms don't engage in any of the activities, and four when all four activities have been undertaken, thereby indicating the full implementation of CE orientation. (Cronbach Alpha: 0.690)

The second dependent variable is CE implementation stages (*CE stages*), categorized into four stages, spanning from null intention to full implementation. The question explores whether there is a strategy or action plan in place to implement circular economy (CE) within the

Table 1
Distribution of SMEs by sector (NACE-Sections).

Sector	Frequency	Percent
B - Mining and quarrying	90	0.5
C - Manufacturing	3184	19.5
D - Electricity, gas, steam and air conditioning supply	100	0.6
E - Water supply, sewerage, waste management/ remediation activities	167	1.0
F - Construction	1576	9.6
G - Wholesale and retail trade, repair of motor vehicles and	4532	27.7
H - Transportation and storage	929	5.7
I - Accommodation and food service activities	919	5.6
J - Information and communication	625	3.8
K - Financial and insurance activities	344	2.1
L - Real estate activities	376	2.3
M - Professional, scientific and technical activities	1524	9.3
N - Administrative and support service activities	720	4.4
P - Education	383	2.3
Q - Human health and social work activities	622	3.8
Arts, entertainment and recreation	274	1.7
Total	16365	100.0

Table 2
Distribution of SMEs by country.

Countries	Frequency	Percent
FR - France	503	3.1
BE - Belgium	500	3.1
NL - The Netherlands	500	3.1
DE - Germany	500	3.1
IT - Italy	500	3.1
LU - Luxembourg	200	1.2
DK - Denmark	500	3.1
IE - Ireland	500	3.1
GB - United Kingdom	502	3.1
GR - Greece	500	3.1
ES - Spain	502	3.1
PT - Portugal	500	3.1
FI - Finland	501	3.1
SE - Sweden	500	3.1
AT - Austria	500	3.1
CY - Cyprus (Republic)	201	1.2
CZ - Czech Republic	501	3.1
EE - Estonia	500	3.1
HU - Hungary	500	3.1
LV - Latvia	500	3.1
LT - Lithuania	500	3.1
MT - Malta	201	1.2
PL - Poland	500	3.1
SK - Slovakia	503	3.1
SI - Slovenia	503	3.1
BG - Bulgaria	500	3.1
RO - Romania	500	3.1
TR - Turkey	300	1.8
HR - Croatia	500	3.1
MK - Makedonia/FYROM	202	1.2
RS - Serbia	200	1.2
NO - Norway	300	1.8
IS - Iceland	201	1.2
JP - Japan	300	1.8
US - USA	501	3.1
BR - Brazil	344	2.1
BA - Bosnia and Herzegovina	200	1.2
RS-KM - Kosovo	200	1.2
CA - Canada	500	3.1
Total	16365	100.0

enterprise, offering the following multi-item options: i) Yes, and it has already been implemented; ii) Yes, and it is in the process of being implemented; iii) No, but it may be considered in the future; and iv) No, and it will not in the future. These options provide a comprehensive overview of the current status and future prospects of CE implementation within the enterprise, allowing respondents to indicate whether CE strategies are already in place, being actively pursued, potentially considered for the future, or not anticipated at all. To establish this, we create an ordinal scale ranging from 1 to 4. Here, 1 signifies null intention, progressing up to 4, which represents complete implementation.

The next group of variables encompass the *obstacles and barriers* encountered by SMEs during the process of implementing CE orientation. The first variable is *resources and capabilities barriers* to implementing CE (*Obstacles 1*). In accordance with the Takacs et al. (2022), Lieder and Rashid (2016), and Hina et al. (2022), we consider that factors such as a lack of willingness among management, insufficient awareness regarding the integration of sustainability into the business model, deficits in skills including managerial skills, and a shortage of financial resources are the primary obstacles that SMEs might confront during CE implementation. The question includes the following multi-item options: i) Lack of willingness among the management; ii) Lack of awareness about how to integrate sustainability into the enterprise's business model; iii) Lack of skills, including managerial skills; and iv) Lack of financial resources. As previous variables, we construct the variable *obstacles (Obstacles 1)* as a cumulative index of these four items.

The second independent variable is *feasibility barriers* to

implementing CE (*Obstacles 2*). Building upon the insights of other Sternad et al. (2019), Chien et al. (2021), we identify three categories of items that SMEs might encounter in assessing the feasibility of implementing a strategic orientation. These include a lack of consumer or customer demand, compatibility with the current business model, and the estimation of profitability (Cronbach Alpha: 0.611). The items include in the questionnaire are: i) Lack of consumer or customer demand; ii) It is not compatible with your current business model; iii) It would not be profitable. Similar to previous variables, we construct the variable *obstacles (Obstacles 2)* as a cumulative index of these three items (Cronbach Alpha: 0.605).

In order to enhance the robustness of our analyses, we have incorporated two control variables. The first control variable pertains to *innovative development*, encompassing the innovation activities undertaken by the SME. Consistent with prior research (Arranz et al., 2019, 2022, 2022b; Gunday et al., 2011), we consider three types of innovation, specifically referring to *process, organizational, and environmental*. The items include in the questionnaire are: i) A new or significantly improved production process or method; ii) A new organisation of management or a new business model; and iii) A new or significantly improved environmental activities. Similar to the approach used with the previous variable, we generate a new variable *innovation* as a cumulative index that comprises the three items.

The second control variable encompasses the support provided to SMEs by their *environment*. Lee (2008) and Hoogendoorn et al. (2015) have emphasized the environment as a determinant of the integration of strategic orientations and innovations. The question posed is how you would rate your business environment in terms of access to and collaboration with business partners, availability of staff with the right skills, including managerial skills, availability of support to help enterprises become more sustainable, legal and administrative environment Infrastructure for businesses, and infrastructure for businesses. The question includes the next items: i) Access to and collaboration with business partners, including other enterprises, the public sector, educational institutions, research organizations.; ii) Availability of staff with the right skills, including managerial skills; iii) Availability of support to help enterprises become more sustainable; iv) Legal and administrative environment Infrastructure for businesses, such as available office space, internet connectivity; and v) Infrastructure for businesses, such as available office space, internet connectivity. The *environmental driver* variable is created as a cumulative index of previous items.

4.3. Empirical analysis

Regarding Hypotheses 1a and 1b, which examine how feasibility barriers and resources and capabilities barriers influence the implementation of CE in SMEs, we utilize *CE Stages* as the dependent variable and *Obstacles 1* and *Obstacles 2* as independent variables. Since the dependent variable is ordinal, the chosen econometric model is Ordinal Logistic Regression. Additionally, two control variables (*Innovation and Environmental Driver*) are included. The econometric models are as follows:

Models 1, 2, 4, and 5:

$$CE\ Stages = constant + \beta_1(Obstacles1) + \beta_2(Obstacles2) + \beta_3(control\ variables) + e$$

Model 3:

$$CE\ Stages = constant + \beta_1(Obstacles1) + \beta_2(Obstacles2) + \beta_3(Obstacles1)^2 + \beta_4(Obstacles2)^2 + \beta_5(control\ variables) + e$$

In relation to Hypotheses 2a and 2b, which examine the influence of feasibility barriers and resources and capabilities barriers on the organizational transformation process towards CE in SMEs, we utilize *CE Degree* as the dependent variable and *Obstacles 1* and *Obstacles 2* as

independent variables. Furthermore, the econometric model incorporates two control variables (*Innovation and Environmental Driver*).

Models 6, 7, 9, and 10:

$$CE \text{ Degree} = \text{constant} + \beta_1(\text{Obstacles1}) + \beta_2(\text{Obstacles2}) + \beta_3(\text{control variables}) + e$$

Model 8:

$$CE \text{ Degree} = \text{constant} + \beta_1(\text{Obstacles1}) + \beta_2(\text{Obstacles2}) + \beta_3(\text{Obstacles1})^2 + \beta_4(\text{Obstacles2})^2 + \beta_5(\text{control variables}) + e$$

5. Analysis and results

Prior to examining into the analysis of the results, a thorough examination of the survey was conducted to ensure the resilience of the questionnaires and responses. Specifically, a validation process was carried out to address the potential issues of common method variance (CMV) and common method bias (CMB), guided by the methodology outlined by Podsakoff et al. (2003). The outcome of this analysis reveals the presence of five distinct latent constructs, collectively accounting for a substantial 58.11% of the variance. Notably, the initial factor explains 16.0897% of the variance, a value that lies below the recommended threshold of 50%. This finding effectively alleviates concerns regarding the presence of CMV and CMB within our results. The validation process, we conducted underscores the robustness of our study. This process provides confirmation that there are no existing methodological biases that could potentially compromise the accurate interpretation of our outcomes.

In Table 3, we present the descriptive values of the dependent variables. Regarding the *CE stages* variable, we show the distribution of SMEs based on their implementation stages, including null implantation, intention, decision, and implementation. Overall, we observe a decline in the number of companies at each successive stage: those with intention (36.7%), those that have decided to implement (23.2%), and those that have successfully implemented (18.1%). Furthermore, in Table 3, we present the values illustrating the level of CE implementation (*CE degree*). Firstly, we observe that approximately half of the firms engage in at least one of the environmental activities, excluding the development of sustainable products, which is undertaken by only 32% of the companies. As for the extent of CE implementation, the table demonstrates that only 18.1% of the companies have fully implemented

Table 3
Dependent variables.

CE Stages	Frequency	Percent
Yes, and it has already been implemented	2955	18.1
Yes, and it is in the process of being implemented	3791	23.2
No, but it may be considered in the future	6012	36.7
No, and it will not in the future	2412	14.7
Missing	1195	7.3
Total	16365	100.0
CE Degree	Frequency	Percent
Environmental Activities		
Recycling or reusing materials	9784	59.8
Reducing consumption of or impact on natural resources	8110	49.6
Saving energy or switching to sustainable energy sources	8269	50.5
Developing sustainable products or services	5239	32.0
Total	16365	100.0
Cumulative Index	Frequency	Percent
0.00	3480	21.3
1.00	3555	21.7
2.00	3105	19.0
3.00	3263	19.9
4.00	2962	18.1
Total	16365	100.0

CE orientation. The remaining companies are at intermediate stages, underscoring the presence of varying degrees of implementation.

Regarding Hypotheses 1a and 1b, which investigate the effect of barriers in the process of CE implementation in SMEs, the results are presented in Table 4. Model 3 confirms the negative effect of both the resources and capabilities obstacles variable (*Obstacles 1*: $\beta = -0.094$; $p < 0.001$) and the feasibility obstacles (*Obstacles 2*: $\beta = -0.479$; $p < 0.001$) on the progress of CE stages. Additionally, Model 3 verifies that the *Obstacles 1* variable in relation to CE implementation follows a U-inverted shape, as indicated by the regression coefficient of the square of the *Obstacles 1* variable ($\beta = -0.044$; $p < 0.001$), thus corroborating Hypothesis 1a. Furthermore, in Model 4, the marginal effects of the *Obstacles 1* variable on the relationship with CE stages are displayed. For the analysis of the results, the regression coefficients represent marginal values concerning the reference value, which has a regression coefficient value of 0. To interpret the regression coefficients, we must consider that $H_0: \beta \leq 0$, meaning negative coefficients imply a lesser effect on the dependent variable; conversely, $H_1: \beta > 0$, with positive coefficients indicating a greater probability of impact on the dependent variable. In our case, the *Obstacles 1* variable ranges from 0 to 4, with the reference value chosen as 4, having a coefficient of regression of 0. Consequently, we observe that the regression coefficients increase relative to the reference value, reaching their maximum value for the value 2. Beyond that point, the values decrease, confirming the U-inverted relationship between *Obstacles 1* and CE implementation. Turning to Hypothesis 1b, Model 5 presents the analysis of marginal effects. We observe that the relative regression coefficients are positive but decrease as the value of *Obstacles 2* increases. This signifies that the marginal effect is diminishing. Therefore, considering that *Obstacles 2* has a negative effect on CE stages, this diminishing effect is demonstrated through decreasing marginal values, thus confirming Hypothesis 1b. Regarding the robustness of our analysis, it can be noted that it is high, as evidenced by the absence of collinearity among variables (VIF) and the absence of autocorrelation between residuals and the dependent variable (Durbin-Watson). Moreover, we have conducted an additional test using a linear regression model, and the results corroborate the previous analysis, considering a non-linear relationship. Both *Obstacles 1* ($\beta = -0.059$; $p < 0.001$) and *Obstacles 2* ($\beta = -0.244$; $p < 0.001$) have negative coefficients in the linear model. Similarly, in the linear model, the square of the *Obstacles 1* variable exhibits a point of inflection, indicated by the negative regression coefficient ($\beta = -0.019$; $p < 0.005$).

Regarding Hypotheses 2a and 2b, which examine the effect of barriers on the degree of CE organizational transformation in SMEs, the results are displayed in Table 5. As observed in Model 8, the negative effect of both the *Obstacles 1* variable ($\beta = -0.232$; $p < 0.001$) and the *Obstacles 2* variable ($\beta = -0.166$; $p < 0.001$) on organizational transformation towards CE is confirmed. Furthermore, Model 3 confirms that the *Obstacles 1* and *Obstacles 2* variables, in relation to the dependent variable, follow a U-inverted shape. This is indicated by the regression coefficients of the square of the *Obstacles 1* variable ($\beta = -0.030$; $p < 0.001$) and the *Obstacles 2* variable ($\beta = -0.032$; $p < 0.001$), thus corroborating Hypotheses 2a and 2b. Additionally, in Models 9 and 10, we present the relative marginal effects of both dependent variables, confirming the U-inverted shape. Moreover, the robustness of our analysis is significant, as indicated by the absence of collinearity among variables (VIF) and the absence of autocorrelation between residuals and the dependent variable (Durbin-Watson). Furthermore, we conducted an additional test using a linear regression model, and the results support the previous analysis, considering a non-linear relationship. In the linear model, both *Obstacles 1* ($\beta = -0.281$; $p < 0.001$) and *Obstacles 2* ($\beta = -0.112$; $p < 0.001$) have negative coefficients. Similarly, in the linear model, the square of the *Obstacles 1* and *Obstacles 2* variables exhibit points of inflection, denoted by the negative regression coefficients ($\beta = -0.042$; $p < 0.005$) and ($\beta = -0.007$; $p < 0.005$), respectively.

Table 4
Regression analysis of CE stages and obstacles.

CE Stages	Model 1	Model 2	Model 3	Model 4	Model 5	VIF
COLLABORATION	0.064*** (0.015)	0.052*** (0.014)	0.051*** (0.014)	0.077*** (0.014)	0.061*** (0.014)	1.145
SKILLS	0.095*** (0.017)	0.077*** (0.017)	0.077*** (0.017)	0.090*** (0.016)	0.095*** (0.016)	1.120
SUSTAINABLE	0.089*** (0.014)	0.108*** (0.014)	0.108*** (0.014)	0.116*** (0.013)	0.119*** (0.013)	1.143
LEGAL	0.050*** (0.017)	0.081*** (0.016)	0.082*** (0.016)	0.077*** (0.018)	0.082*** (0.018)	1.112
INFRASTRUCTURE	0.077*** (0.018)	0.069*** (0.018)	0.071*** (0.018)	0.285*** (0.039)	0.287*** (0.039)	1.103
PROCESS INNOVATION	0.249*** (0.039)	0.291*** (0.039)	0.289*** (0.039)	0.384	0.373*** (0.041)	1.065
ENVIRONMENTAL INNOVATION	0.752 ^c (0.037)	0.743 ^c (0.037)	0.748*** (0.037)	0.751*** (0.037)	0.748*** (0.037)	1.090
ORGANISATIONAL INNOVATION	0.335 ^c (0.041)	0.389 ^c (0.041)	0.389 ^c (0.041)			1.994
OBSTACLES 1		-0.137 ^c (0.015)	-0.094 ^c (0.021) ^c			1.379
OBSTACLES 2		-0.429 ^c (0.015)	-0.479 ^c (0.023)			1.006
(OBSTACLES 1) ²			-0.044 ^c (0.012)			1.257
(OBSTACLES 2) ²			0.052 ^c (0.013)			1.109
OBSTACLES1 = .00				0.570*** (0.130)		
OBSTACLES 1 = 1.00				0.871*** (0.126)		
OBSTACLES 1 = 2.00				1.068*** (0.125)		
OBSTACLES 1 = 3.00				0.339*** (0.139)		
OBSTACLES 1 = 4.00				0 ^a		
OBSTACLES 2 = .00					1.199 ^c (0.080)	
OBSTACLES 2 = 1.00					0.611 ^c (0.081)	
OBSTACLES 2 = 2.00					0.265 ^b (0.088)	
OBSTACLES 2 = 3.00					0.182 ^a (0.080)	
OBSTACLES 2 = 4.00					0 ^a	
-2 Log Likelihood	26581.415	29035.450	29002.270	16459.895	15719.914	
Chi-Square	1142.565	2036.783	2069.962	1385.301	1791.949	
Sig.	0.000	0.000	0.000	0.000	0.000	
Cox and Snell	0.073	0.126	0.128	0.087	0.111	
Nagelkerke	0.078	0.135	0.137	0.094	0.120	
McFadden	0.028	0.051	0.052	0.034	0.045	

^a p < 0.05.

^b p < 0.01.

^c p < 0.001. Durbin-Watson (Model 3): 1.882.

Table 5
Regression analysis of CE organisational transformation level and obstacles.

CE Degree	Model 6	Model 7	Model 8	Model 9	Model 10	VIF
COLLABORATION	0.041 ^b (0.013)	0.045 ^b	0.044 ^b (0.013)	0.051 ^b (0.013)	0.028 ^b (0.015)	1.151
SKILLS	0.050 ^b (0.015)	0.031 ^a	0.030 ^a (0.015)	0.020 ^a (0.015)	0.001 ^a (0.016)	1.123
SUSTAINABLE	0.138 ^c (0.013)	0.134 ^c	0.133 ^c (0.013)	0.149*** (0.012)	151 ^c (0.012)	1.151
LEGAL	0.087 ^c (0.015)	0.079 ^c	0.079 ^c (0.015)	0.724 ^c (0.037)	0.736 ^c (0.037)	1.116
INFRASTRUCTURE	0.018 (0.016)	0.009 (0.016)	0.010 (0.016)	0.04 (0.016)	0.020 (0.016)	1.103
PROCESS INNOVATION	0.742 ^c (0.037)	0.719*** (0.037)	0.720*** (0.037)	0.693*** (0.039)	1.326*** (0.037)	1.067
ENVIRONMENTAL INNOVATION	1.314 ^c (0.037)	1.323*** (0.037)	1.321*** (0.037)	1.319*** (0.037)		1.089
ORGANISATIONAL INNOVATION	0.432 ^c (0.039)	0.391*** (0.039)	0.390*** (0.040)			1.119
OBSTACLES 1		-0.193*** (0.014)	-0.232*** (0.020)			1.009
OBSTACLES 2		-0.115*** (0.014)	-0.166*** (/022)			1.067
(OBSTACLES 1) ²			-0.030*** (0.012)			1.225
(OBSTACLES 2) ²			-0.032*** (0.012)			1.301
OBSTACLES 1 = .00				-0.507 ^c (0.120)		
OBSTACLES 1 = 1.00				-0.272 ^c (0.121)		
OBSTACLES 1 = 2.00				-0.002*** (0.125)		
OBSTACLES 1 = 3.00				0.111**		
OBSTACLES 1 = 4.00				.(134)		
OBSTACLES 2 = .00				0 ^a		
OBSTACLES 2 = 1.00					-0.505*** (0.076)	
OBSTACLES 2 = 2.00					-0.356** (0.077)	
OBSTACLES 2 = 3.00					-0.211** (0.050)	
OBSTACLES 2 = 4.00					0.025* (0.084)	
					0 ^a	
-2 Log Likelihood	20211.405	37751.388	37739.376	20627.708	20014.320	
Chi-Square	2896.834	3148.956	3160.968	3071.022	3010.373	
Sig.	0.000	0.000	0.000	0.000	0.000	
Cox and Snell	0.162	0.175	0.176	0.171	0.168	
Nagelkerke	0.169	0.182	0.183	0.178	0.175	
McFadden	0.055	0.060	0.060	0.058	0.057	

^a p < 0.05.

^b p < 0.01.

^c p < 0.001. Durbin-Watson (Model 3): 1.702.

6. Discussion

In the context of [Hypothesis 1a](#), which investigates into the process of decision and implementation of CE within SMEs, our findings shed light on the dynamics of this process. It becomes evident that SMEs grapple with a preliminary feasibility barrier—a juncture where the senior manager encounters the hurdle of assessing the feasibility of adopting a CE orientation for implementation. Should the SME perceive the viability of CE implementation, it advances to subsequent stages, intention and decision-making, while experiencing a gradual decline in the perception of barriers. This trajectory resonates with existing literature, which underscores that these barriers serve as catalysts, propelling organizational change processes ([Whelan-Berry and Somerville, 2010](#)). To elaborate, organizations thoroughly scrutinize the congruence of the strategic orientation with their prevailing business model, the potential profitability of the proposed orientation, and the market landscape before making pivotal decisions ([Bocken and Geradts, 2020](#); [Whelan-Berry and Somerville, 2010](#)). In this context, acknowledging the pivotal role assumed by senior managers within SMEs holds paramount importance. The evaluation of the feasibility of integrating a CE strategic orientation falls within their purview, and prior research on SMEs accentuates the significant impact senior managers wield in shaping the strategic trajectories of these enterprises ([Bauweraerts et al., 2022](#); [Schwens et al., 2011](#); [Moreno and Casillas, 2008](#)). Furthermore, our study aligns with the premise that self-efficacy, an individual's confidence in their own capabilities, alongside their ability to exercise control over situations and draw from past experiences, significantly influence proactive behaviours ([Ryan and Deci, 2000](#); [Gagné and Deci, 2005](#)). Within this framework, the manager's assimilation of the strategic orientation rests on a continuum of confidence, situational control, and self-efficacy. These elements, in turn, shape the manager's proactive participation ([Ryan and Deci, 2000](#); [Gagné and Deci, 2005](#)). Consequently, the manager evaluates the feasibility of implementing the CE orientation, progressing through successive stages, intention, decision, and eventual implementation, as they discern the practicality of adopting the CE orientation within the SME's operational landscape.

Regarding [Hypothesis 1b](#), our results show a second group of obstacles in the decision-implementation of CE orientation in SME. The emergence of the second group of obstacles becomes apparent during the implementation phase, as SMEs delve into the intricacies of the process and uncover the prerequisites for securing the necessary resources and competencies. This scenario gives rise to a distinctive relationship in the context of CE orientation implementation a U-shaped curve. Initially, when intention is non-existent, obstacles may not be readily perceived. However, as the implementation journey progresses, SMEs encounter an increasing array of barriers and hurdles. As a result, the perception of these obstacles ascends, peaking at a certain juncture, and then diminishes as subsequent stages are surmounted, facilitated by the accumulation of resources and capabilities through experiential learning within the process. Furthermore, Authors underscore the notion that inertial tendencies intrinsic to SMEs and the existing structured routines, coupled with limitations in resources and capabilities, might not inherently deter the process. As a corollary, aligning with the precepts of innovation theory and building upon the insights from [D'Este et al. \(2012\)](#), where the trajectory of innovation implementation shifts from hurdles that thwart progress to challenges that become apparent, we posit that the momentum of CE orientation implementation advances when such a transformative shift occurs. In essence, firms, driven by learning and experience, adeptly navigate these hurdles, thereby enabling them to persist in their trajectory of organizational transformation.

The next set of hypotheses (Hypotheses 2a and 2b) have explored into the notion that the integration of CE orientation might lead to a variation in the extent of organizational transformation within SMEs. In line with the authors' perspectives, CE implementation involves the amalgamation of diverse environmental actions, spanning activities

such as material recycling, resource consumption reduction, energy conservation, and the creation of sustainable products or services. Our model asserts that firms embark on an incremental journey of organizational transformation, wherein they gradually incorporate the spectrum of environmental activities, culminating in the full integration of CE principles. Consequently and in line with [D'Este et al. \(2012\)](#), we posit that this degree of organizational transformation is influenced by SMEs' ability to surmount the barriers intrinsic to this process. As this degree of integration and transformation intensifies, it necessitates a higher commitment of resources and competencies from employees, which could be perceived as a growing obstacle. Yet, previous literature underscores that the integration of new strategic orientations demands resources and competencies from the organization, which can potentially compete with existing orientations for the allocation of resources ([Ardito et al., 2021](#)). [Moeuf et al. \(2018\)](#) and [Ardito et al. \(2021\)](#) expound on the integration of new orientations, emphasizing that the requisite knowledge, relational dynamics, and human resources differ and serve distinct objectives. This becomes particularly significant for SMEs due to their inherent resource limitations. Therefore, our results show that as the level of integration and organizational transformation deepens, managers find themselves required to allocate more attention to the seamless integration of CE principles. Given the constraints of time and resources, this heightened focus may inadvertently amplify the perception of barriers and obstacles concerning the feasibility of CE orientation. However, in alignment with the innovation theory barriers ([D'Este et al., 2012](#)), if the SME successfully navigates this journey of organizational transformation and converts these barriers from obstacles into challenges to overcome, the firm will advance in both the integration and digital transformation processes.

Therefore, our paper explores the decision-making and implementation processes of CE orientation within SMEs. It reveals that SMEs initially encounter a feasibility barrier where senior managers assess the viability of adopting CE. If considered feasible, they progress through stages of intention, decision-making, and implementation, with perceived barriers gradually declining. The paper highlights the significant role of senior managers in shaping strategic trajectories and emphasizes the influence of self-efficacy on proactive behaviours. Additionally, it identifies a second group of obstacles emerging during the implementation phase, resulting in a U-shaped curve of obstacle perception. The study suggests that firms adeptly navigate hurdles through experiential learning, facilitating organizational transformation. Furthermore, it posits that the degree of organizational transformation influenced by SMEs' ability to overcome barriers is incremental, demanding increased commitment of resources and competencies, potentially amplifying the perception of barriers. However, successful navigation of this transformation journey can lead to advancement in both integration and digital transformation processes.

7. Conclusions

Our preliminary analysis and conclusions highlight important contribution to the literature on the CE and on strategic orientations. In particular, our paper contributes to the literature studying the CE implementation, the literature on CE strategic orientation in the integration process, the literature on CE implementation and digital technologies, and finally, the literature on strategic orientation. Moreover, the results from our paper have important implications for managerial practice as it provides a better understanding of the CE transformational process, and for policy-makers as it provides insight into potential routes to foster the CE among SMEs.

Our first theoretical contribution lies within the realm of environmental literature, specifically focusing on the implementation of CE. Firstly, we have formulated a model of the implementation process, dissecting the role of barriers and obstacles throughout the implementation journey. In the context of SMEs, we have identified two distinct types of barriers: preliminary feasibility barriers, in which the

senior manager's role is pivotal; and obstacles arising from the necessity of possessing resources and capabilities for successful implementation. Consequently, SMEs can advance if they are adept at transforming these barriers from deterrents to challenges, enabling them to transition from intention to full implementation. Secondly, our paper provides a contribution by emphasizing that CE implementation involves the amalgamation of diverse environmental activities. This process signifies SMEs' progression towards complete CE integration through a gradual journey characterized by varying degrees of integration. Notably, the extent of integration is influenced by the SME's ability to convert deterrence barriers into revealed challenges. This notion underscores how the level of penetration of integration hinges on the organization's proficiency in navigating and transforming deterrent barriers. In essence, our study not only elucidates the dynamics of CE implementation but also underscores the critical role of barriers and their transformation in the implementation journey. Moreover, our research accentuates the multifaceted nature of CE integration, emphasizing its incremental and multi-dimensional character, thereby contributing to the environmental literature and our understanding of the complexities associated with sustainable business practices within SMEs.

The second theoretical contribution extends to the strategy orientations perspective, investigating into the dynamic facets of their implementation. Our model conceptualizes the implementation process of strategy orientation as a multi-stage trajectory, guiding SMEs through phases that encompass intention, decision-making, and the ultimate integration of CE orientation. Existing literature already emphasizes the challenges that firms encounter as they strive to adopt strategic orientations aligned with CE principles. Drawing on the insights of D'Este et al. (2012), the significance of lacking the necessary knowledge, organizational skills, and prior experience in relevant technologies becomes apparent. These elements play a crucial role in facilitating the continuous incorporation of the CE model within the organization's framework. As SMEs navigate through this implementation process, it becomes increasingly clear that the prerequisites for success extend beyond managerial expertise and financial resources – they must also possess the essential capabilities required for effective integration.

Moreover, the paper has an important managerial implications. First, managers should recognize the dual nature of barriers faced during the implementation of CE initiatives in SMEs. Understanding that feasibility barriers and resource-related obstacles act as distinct challenges allows for a more targeted approach. It's crucial to involve senior managers early on to assess the feasibility of CE adoption and develop strategies to overcome initial resistance. Second, SMEs should approach the integration of CE as a gradual process rather than a sudden transformation. Recognizing that CE involves a combination of diverse environmental activities, such as recycling, reducing consumption, and sustainable product development, will help SMEs develop a step-by-step roadmap. This approach enables the organization to progress towards full CE integration, ensuring that each stage is executed effectively. Third, SMEs' managers should be mindful of potential learning paradoxes that may arise due to a varied scope of knowledge required for CE implementation. Balancing employees' capacity to absorb new information and skills is essential. Encouraging continuous learning and providing adequate support can help SMEs overcome the challenges of juggling diverse tasks and responsibilities. By addressing these managerial implications, SMEs can navigate the challenges of implementing CE orientations effectively and sustainably, driving positive environmental impact and organizational transformation.

While the paper provides valuable insights into the dynamic process of CE implementation within SMEs, it also has certain limitations. Firstly, the study relies solely on data from the EU database, potentially limiting the generalizability of findings to SMEs outside of the EU context. Additionally, the paper focuses predominantly on internal barriers without extensively considering external factors that may influence CE implementation, such as regulatory environments or market conditions. Moreover, the research primarily emphasizes the role of

senior managers in decision-making processes, potentially overlooking the perspectives and contributions of other stakeholders within SMEs. Furthermore, the study lacks a longitudinal perspective, which could provide deeper insights into the long-term impacts and sustainability of CE implementation within SMEs. Lastly, while the integrated theoretical framework used in the study offers a comprehensive understanding, it may overlook nuances and complexities that arise from the interdisciplinary nature of CE implementation.

CRediT authorship contribution statement

Carlos F.A. Arranz: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marta F. Arroyabe:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Juan Carlos Fernandez de Arroyabe:** Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

There is no conflict of interest.

Data availability

Data will be made available on request.

References

- Altomonte, C., Gamba, S., Mancusi, M.L., Vezzulli, A., 2016. R&D investments, financing constraints, exporting and productivity. *Econ. Innovat. N. Technol.* 25 (3), 283–303.
- Ardito, L., Raby, S., Albino, V., Bertoldi, B., 2021. The duality of digital and environmental orientations in the context of SMEs: implications for innovation performance. *J. Bus. Res.* 123, 44–56.
- Arranz, C.F., Sena, V., Kwong, C., 2022. Institutional pressures as drivers of circular economy in firms: a machine learning approach. *J. Clean. Prod.* 355, 131738.
- Arranz, N., Arroyabe, M.F., Li, J., Fernandez de Arroyabe, J.F., 2019. An integrated model of organisational innovation and firm performance: generation, persistence and complementarity. *J. Bus. Res.* 105, 270–282.
- Arranz, N., Arroyabe, M.F., Li, J., Arranz, C.F., Fernandez de Arroyabe, J.C., 2022. An integrated view of eco-innovation in the service sector: dynamic capability, cooperation and corporate environmentalism. *Bus. Strat. Environ.* <https://doi.org/10.1002/bse.3276>.
- Asgari, A., Asgari, R., 2021. How circular economy transforms business models in a transition towards circular ecosystem: the barriers and incentives. *Sustain. Prod. Consum.* 28, 566–579.
- Bassi, F., Dias, J.G., 2020. Sustainable development of small-and medium-sized enterprises in the European Union: a taxonomy of circular economy practices. *Bus. Strat. Environ.* 29 (6), 2528–2541.
- Bauweraerts, J., Rondi, E., Rovelli, P., De Massis, A., Sciascia, S., 2022. Are family female directors catalysts of innovation in family small and medium enterprises? *Strateg. Entrep. J.* 16 (2), 314–354.
- Blomsma, F., Brennan, G., 2017. The emergence of circular economy: a new framing around prolonging resource productivity. *J. Ind. Ecol.* 21 (3), 603–614.
- Bocken, N.M., Geradts, T.H., 2020. Barriers and drivers to sustainable business model innovation: organization design and dynamic capabilities. *Long. Range Plan.* 53 (4), 101950.
- Bocken, N., Konietzko, J., 2022. Circular business model innovation in consumer-facing corporations. *Technol. Forecast. Soc. Change* 185, 122076.
- Bocken, N., Pinkse, J., Darnall, N., Ritala, P., 2023. Between circular paralysis and utopia: organizational transformations towards the circular economy. *Organ. Environ.*, 10860266221148298
- Bojesson, C., Fundin, A., 2021. Exploring microfoundations of dynamic capabilities—challenges, barriers and enablers of organizational change. *J. Organ. Change Manag.* 34 (1), 206–222.
- Brammer, S., Pavelin, S., 2008. Factors influencing the quality of corporate environmental disclosure. *Bus. Strat. Environ.* 17 (2), 120–136.
- Chien, F., Ngo, Q.T., Hsu, C.C., Chau, K.Y., Iram, R., 2021. Assessing the mechanism of barriers towards green finance and public spending in small and medium enterprises from developed countries. *Environ. Sci. Pollut. Control Ser.* 28 (43), 60495–60510.
- D'Este, P., Iammarino, S., Savona, M., Von Tunzelmann, N., 2012. What hampers innovation? Revealed barriers versus deterring barriers. *Res. Pol.* 41 (2), 482–488.
- De Jesus, A., Mendonça, S., 2018. Lost in transition? Drivers and barriers in the eco-innovation road to the circular economy. *Ecol. Econ.* 145, 75–89.
- Dey, P.K., Malesios, C., Chowdhury, S., Saha, K., Budhwar, P., De, D., 2022. Adoption of circular economy practices in small and medium-sized enterprises: evidence from Europe. *Int. J. Prod. Econ.* 248, 108496.

- Eikelenboom, M., de Jong, G., 2022. The impact of managers and network interactions on the integration of circularity in business strategy. *Organ. Environ.* 35 (3), 365–393.
- Ellen MacArthur Foundation, 2015. *Towards the Circular Economy: an Economic and Business Rationale for an Accelerated Transition*. Ellen MacArthur Foundation, Cowes, UK. www.ellenmacarthurfoundation.org.
- European Commission, 2020. *Flash eurobarometer 486 (SMEs, start-ups, scale-ups and entrepreneurship)*. <https://doi.org/10.4232/1.13639>.
- Fernandez de Arroyabe, J.C., Arranz, N., Schumann, M., Arroyabe, M.F., 2021. The development of CE business models in firms: the role of circular economy capabilities. *Technovation* 106, 102292.
- Ferrell, O.C., Gonzalez-Padron, T.L., Hult, G.T.M., Maignan, I., 2010. From market orientation to stakeholder orientation. *J. Publ. Pol. Market.* 29 (1), 93–96.
- Frambach, R.T., Fiss, P.C., Ingenbleek, P.T., 2016. How important is customer orientation for firm performance? A fuzzy set analysis of orientations, strategies, and environments. *J. Bus. Res.* 69 (4), 1428–1436.
- Gagné, M., Deci, E.L., 2005. Self-determination theory and work motivation. *J. Organ. Behav.* 26 (4), 331–362.
- Galia, F., Legros, D., 2004. Complementarities between obstacles to innovation: evidence from France. *Res. Pol.* 33 (8), 1185–1199.
- Gunday, G., Ulusoy, G., Kilic, K., Alpkan, L., 2011. Effects of innovation types on firm performance. *Int. J. Product. Econ.* 133 (2), 662–676.
- Hina, M., Chauhan, C., Kaur, P., Kraus, S., Dhir, A., 2022. Drivers and barriers of circular economy business models: where we are now, and where we are heading. *J. Clean. Prod.* 333, 130049.
- Hoogendoorn, B., Guerra, D., van der Zwan, P., 2015. What drives environmental practices of SMEs? *Small Bus. Econ.* 44, 759–781.
- Kim, B., Kim, E., Foss, N.J., 2016. Balancing absorptive capacity and inbound open innovation for sustained innovative performance: An attention-based view. *Euro. Manag. J.* 34 (1), 80–90.
- Kirchherr, J., Reike, D., Hekkert, M., 2017. Conceptualizing the circular economy: An analysis of 114 definitions. *Resour. Conserv. Recycl.* 127, 221–232.
- Kuhlmann, M., Meuer, J., Bening, C.R., 2023. Interorganizational sensemaking of the transition toward a circular value chain. *Organ. Environ.* 10860266231162057.
- Kumar, K., Boesso, G., Favotto, F., Menini, A., 2012. Strategic orientation, innovation patterns and performances of SMEs and large companies. *J. Small Bus. Enterprise Dev.* 19 (1), 132–145.
- Lee, S.Y., 2008. Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives. *Supply Chain Manag.: Int. J.* 13 (3), 185–198.
- Lieder, M., Rashid, A., 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. *J. Clean. Prod.* 115, 36–51.
- Lüdeke-Freund, F., Gold, S., Bocken, N.M., 2019. A review and typology of circular economy business model patterns. *J. Ind. Ecol.* 23 (1), 36–61.
- Malesios, C., Skouloudis, A., Dey, P.K., Abdelaziz, F.B., Kantartzis, A., Evangelinos, K., 2018. Impact of small- and medium-sized enterprises sustainability practices and performance on economic growth from a managerial perspective: modelling considerations and empirical analysis results. *Bus. Strat. Environ.* 27, 960–972.
- Mathews, J.A., Tan, H., Hu, M.C., 2018. Moving to a circular economy in China: transforming industrial parks into eco-industrial parks. *Calif. Manag. Rev.* 60 (3), 157–181.
- Matsuno, K., Mentzer, J.T., 2000. The effects of strategy type on the market orientation–performance relationship. *J. Market.* 64 (4), 1–16.
- Mendoza, J.M.F., Sharmina, M., Gallego-Schmid, A., Heyes, G., Azapagic, A., 2017. Integrating backcasting and eco-design for the circular economy: the BECE framework. *J. Ind. Ecol.* 21 (3), 526–544.
- Moeuf, A., Pellerin, R., Lamouri, S., Tamayo-Giraldo, S., Barbaray, R., 2018. The industrial management of SMEs in the era of Industry 4.0. *Int. J. Prod. Res.* 56 (3), 1118–1136.
- Mohnen, P., Röller, L.H., 2005. Complementarities in innovation policy. *Eur. Econ. Rev.* 49 (6), 1431–1450.
- Moreno, A.M., Casillas, J.C., 2008. Entrepreneurial orientation and growth of SMEs: a causal model. *Entrep. Theory Pract.* 32 (3), 507–528.
- Morseletto, P., 2020. Targets for a circular economy. *Resour. Conserv. Recycl.* 153, 104553.
- Mura, M., Longo, M., Zanni, S., 2020. Circular economy in Italian SMEs: a multi-method study. *J. Clean. Prod.* 245, 118821.
- Narver, J.C., Slater, S.F., 1990. The effect of a market orientation on business profitability. *J. Market.* 54 (4), 20–35.
- Ocasio, W., 1997. Towards an attention-based view of the firm. *Strateg. Manag. J.* 18 (S1), 187–206.
- OECD, 2018a. *Fostering greater SME participation in a globally integrated economy*. <http://tinyurl.com/2p8cedns>.
- OECD, 2018b. *SMEs: key drivers of green and inclusive growth*. <https://tinyurl.com/yc2zrne4>.
- Ormazabal, M., Prieto-Sandoval, V., Puga-Leal, R., Jaca, C., 2018. Circular economy in Spanish SMEs: challenges and opportunities. *J. Clean. Prod.* 185, 157–167.
- Park, S.I., Seo, J.H., 2018. Does strategic orientation fit all? The effects of strategic orientation on high versus low-performing SMEs. *Asian J. Technol. Innovat.* 26 (3), 290–305.
- Pett, T.L., Francis, J., Wolff, J.A., 2019. The interplay of strategic orientations and their influence on SME performance. *J. Small Bus. Strat.* 29 (3), 46–59.
- Pieroni, M.P., McAloone, T.C., Pigosso, D.C., 2019. Business model innovation for circular economy and sustainability: a review of approaches. *J. Clean. Prod.* 215, 198–216.
- Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. *J. Appl. Psychol.* 88 (5), 879.
- Russo, A., Tencati, A., 2009. Formal vs. informal CSR strategies: evidence from Italian micro, small, medium-sized, and large firms. *J. Bus. Ethics* 85, 339–353.
- Ryan, R.M., Deci, E.L., 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am. Psychol.* 55 (1), 68.
- Sarja, M., Onkila, T., Mäkelä, M., 2021. A systematic literature review of the transition to the circular economy in business organizations: obstacles, catalysts and ambivalences. *J. Clean. Prod.* 286, 125492.
- Schmidt, C.V.H., Kindermann, B., Behlau, C.F., Flatten, T.C., 2021. Understanding the effect of market orientation on circular economy practices: the mediating role of closed-loop orientation in German SMEs. *Bus. Strat. Environ.* 30 (8), 4171–4187.
- Schwens, C., Eiche, J., Kabst, R., 2011. The moderating impact of informal institutional distance and formal institutional risk on SME entry mode choice. *J. Manag. Stud.* 48 (2), 330–351.
- Sternad, D., Krenn, M., Schmid, S., 2019. Business excellence for SMEs: motives, obstacles, and size-related adaptations. *Total Qual. Manag. Bus. Excel.* 30 (1–2), 151–168.
- Takacs, F., Brunner, D., Frankenberger, K., 2022. *Barriers to a Circular Economy in Small-And Medium-Sized Enterprises and Their Integration in a Sustainable Strategic Management Framework*, vol. 362, 132227.
- Tura, N., Hanski, J., Ahola, T., Stähle, M., Piiparinen, S., Valkokari, P., 2019. Unlocking circular business: a framework of barriers and drivers. *J. Clean. Prod.* 212, 90–98.
- Whelan-Berry, K.S., Somerville, K.A., 2010. Linking change drivers and the organizational change process: a review and synthesis. *J. Change Manag.* 10 (2), 175–193.
- World Bank Finance, 2021. *Improving SMEs' access to finance and finding innovative solutions to unlock sources of capital*. <https://tinyurl.com/2ap98wrn>.