Circular Economy Adoption in MSMEs: Unveiling Enablers and Barriers

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2024

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Abstract

Purpose The study aims to explore the enablers and barriers to the adoption of Circular Economy (CE) practices in Micro, Small and Medium Enterprises (MSMEs) and examine how these factors differ between developed and developing countries.

Methodology The research utilises a Systematic Literature Review (SLR) methodology to identify key enablers and barriers to CE adoption in MSMEs. The SLR process involved a detailed search and analysis of relevant academic articles from the Scopus and Web of Science databases, following the PRISMA guidelines to ensure transparency.

Findings The study identifies 19 enablers and 16 barriers to CE adoption in MSMEs. Technological upgrades are the key factor helping MSMEs successfully implement CE practices, while financial constraints are the main challenge they face, according to studies from both developed and developing countries.

Originality This research contributes to the existing body of literature by not only identifying the primary factors that either support or impede the implementation of CE by MSMEs but also by classifying them according to developed and developing countries to provide policymakers and MSME stakeholders with valuable insights on enhancing the implementation of CE in both countries by taking into account the particular barriers and enablers faced by each group individually.

Keywords: Circular economy; MSMEs; Enablers and barriers; Systematic literature review

JEL Classification: L26, Q56

1 Introduction

The exponential growth of the world population and the increasing exploitation of natural resources, along with the shorter lifespan of products, are significant issues that have expedited the exhaustion of resources (Bakker *et al.*, 2014). The studies conducted by Geissdoerfer *et al.* (2017) examined the negative impact of linear and open-ended economic systems on the

environment. Their study indicates that a linear economy is characterised by primary obstacles like the issue of waste, the management of waste dumps, the escalating environmental risks, the absence of a competitive edge and its contradiction with sustainable development initiatives. In light of the constraints of the traditional linear economy, which operates on the principles of "take, make, use and waste," the notion of a circular economy (CE) is increasingly being embraced as a strategy to transition towards sustainable, resource-efficient and competitive economies (Garcés-Ayerbe *et al.*, 2019). The concept of the CE has gained significant popularity among policymakers, business audiences and academicians in recent years, thanks to a growing global awareness of environmental issues (Kok *et al.*, 2013). It is an economic system that focuses on minimising waste, promoting the reuse of materials and regenerating resources to achieve both economic prosperity and environmental quality (Kirchherr *et al.*, 2017).

In recent years, there has been a significant increase in research dedicated to elucidating the concept of CE as a paradigm and its connection to sustainable development (Geissdoerfer *et al.*, 2017). CE focuses on the United Nations Sustainable Development Goals (SDGs), namely SDG1 - eradicating poverty, SDG2 - eradicating hunger, SDG7 - ensuring affordable and clean energy, SDG9 - promoting inclusive and sustainable industrialisation and innovation, SDG11 - fostering sustainable cities and communities and SDG12 - promoting responsible consumption and production (Ellen MacArthur Foundation, 2019).

The CE practices by MSMEs are crucial in attaining economic, social and environmental objectives as they account for 90% of corporate entities worldwide and contribute to over 50% of global employment (Kuzmisin and Kuzmisinova, 2016). However, the implementation of CE is particularly concerning in MSMEs, as these firms have faced extensive criticism for their lack of environmental priority, inefficient use of resources and weak adherence to environmental management initiatives (Dey *et al.*, 2022). Numerous research studies have investigated the barriers and enablers encountered by MSMEs when implementing CE practices. (Briguglio *et al.*, 2021; Corsini *et al.*, 2022; Ormazabal *et al.*, 2018; Palombi *et al.*, 2024; Rizos *et al.*, 2016; Scipioni *et al.*, 2021; Takacs *et al.*, 2022). De la Cuesta-González and Morales-García (2022) examined the perception of financiers that CE innovations exhibit more risk compared to conventional innovations, mostly attributed to a misinterpretation of CE business models. Furthermore, Suchek *et al.* (2023) and Findik *et al.* (2023) emphasise the significance of technological advancement in

the form of Industry 4.0 for the effective application of CE principles. Nevertheless, the existing studies mostly focus on the context of developed countries, with only a limited number of studies addressing developing countries in this particular setting. Notable examples include Saharan *et al.* (2024), Sohal *et al*. (2022), Sharma *et al.* (2021) and Cantú *et al.* (2021). However, the existing literature on the adoption of CE principles in the MSMEs is still scattered. The present study enhances the current literature by not only identifying the main factors that facilitate or hinder the adoption of CE practices by MSMEs but also analysing the popularity of those enablers and barriers to how frequently they appeared in the article portfolio. The study categorised the barriers and enablers based on developed and developing countries to offer policymakers and MSME stakeholders valuable insights on boosting the adoption of CE in developed and developing countries, considering the specific enablers and obstacles encountered by each group separately. The present study aims to investigate the following research issues within this particular context: (RQ1) What is the research profile of previous literature on the factors that promote or hinder CE adoption in MSMEs? (RQ2) What are the key enablers and barriers to the successful implementation of CE principles in the MSMEs sector, and how do these factors differ between developed and developing countries?

The remainder of the paper is organised as follows. Section 2 provides a theoretical basis for the CE and the implementation of CE practices in MSMEs; Section 3 provides a detailed explanation of the technique that forms the foundation of our investigation; Section 4 provides a rationale for the content analysis reported in this work and aligns its findings with current scientific research; Section 5 discusses the findings from content analysis; and finally, Section 6 provides the study's conclusions, policy implications as well as limitations of the current study, highlighting the areas for future research scopes.

2 Theoretical foundations

2.1 CE concept

The concepts of the CE are not novel; rather, the terminology was initially used in the literature during the early 1990s by Pearce and Turner. More precisely, the CE embodies a novel manufacturing system that involves the "reduction, reuse and recycling" of raw resources. Industrial processes convert environmental resources into goods and services. Subsequently,

consumers or other corporations use them as secondary products. In diverse value chains, such products must be reused as raw materials and energy (Ellen MacArthur Foundation, 2019). In their examination of 114 definitions of CE, Kirchherr *et al.* (2017) encompass various CE business models, subsequently CE operating levels (macro, meso and micro) and incorporate several sustainable performance dimensions (environmental quality, economic prosperity and social equality). Each of these factors is crucial for comprehending the acceptance of CE in MSMEs. CE offers several potential advantages, including environmental, social and competitive benefits for corporate enterprises (Govindan and Hasanagic, 2018).

2.2 CE practices in MSMEs

The World Bank asserts that MSMEs account for 90% of corporate entities worldwide and contribute to over 50% of global employment (Kuzmisin and Kuzmisinova, 2016). Although MSMEs are generally praised for their significant role in economic development, they have faced extensive criticism for their lack of environmental priority, inefficient use of resources and weak adherence to environmental management initiatives (Dey *et al.*, 2022). Nevertheless, the attributes of MSMEs vary from those of larger firms (Zahra *et al.*, 2006). Significantly, the adoption of CE has mostly been examined from the standpoint of large organisations, with relatively few research focussing on MSMEs (Dey *et al.*, 2022). Implementing a circular model is expensive, and restructuring strategy and business models necessitate proficient organisational and administrative abilities (Arranz *et al.*, 2024). Although the shift from linear economy to CE for MSMEs is challenging due to the presence of several obstacles, it is crucial for attaining sustainability objectives (Holzer *et al.*, 2021; Kirchherr *et al.*, 2018). Therefore, identifying the barriers and enablers of CE in the setting of MSMEs is highly valuable.

3 Methodology

The present study applied the Systematic Literature Review (SLR) method employed by previous research (Hina *et al.*, 2022; Suchek and Franco, 2024) to comprehensively evaluate and combine the existing literature on the enablers and barriers to the implementation of CE practices in MSMEs. This study begins by establishing research criteria and selecting appropriate articles through a well-defined data search and extraction procedure. The second phase involved the acquisition of papers. The third step involved analysing and synthesising the papers to determine

their relevance to the issue. The ultimate phase entailed the presentation of the documents, which were categorised by year, journal and economic status of different countries.

3.1 Search criteria

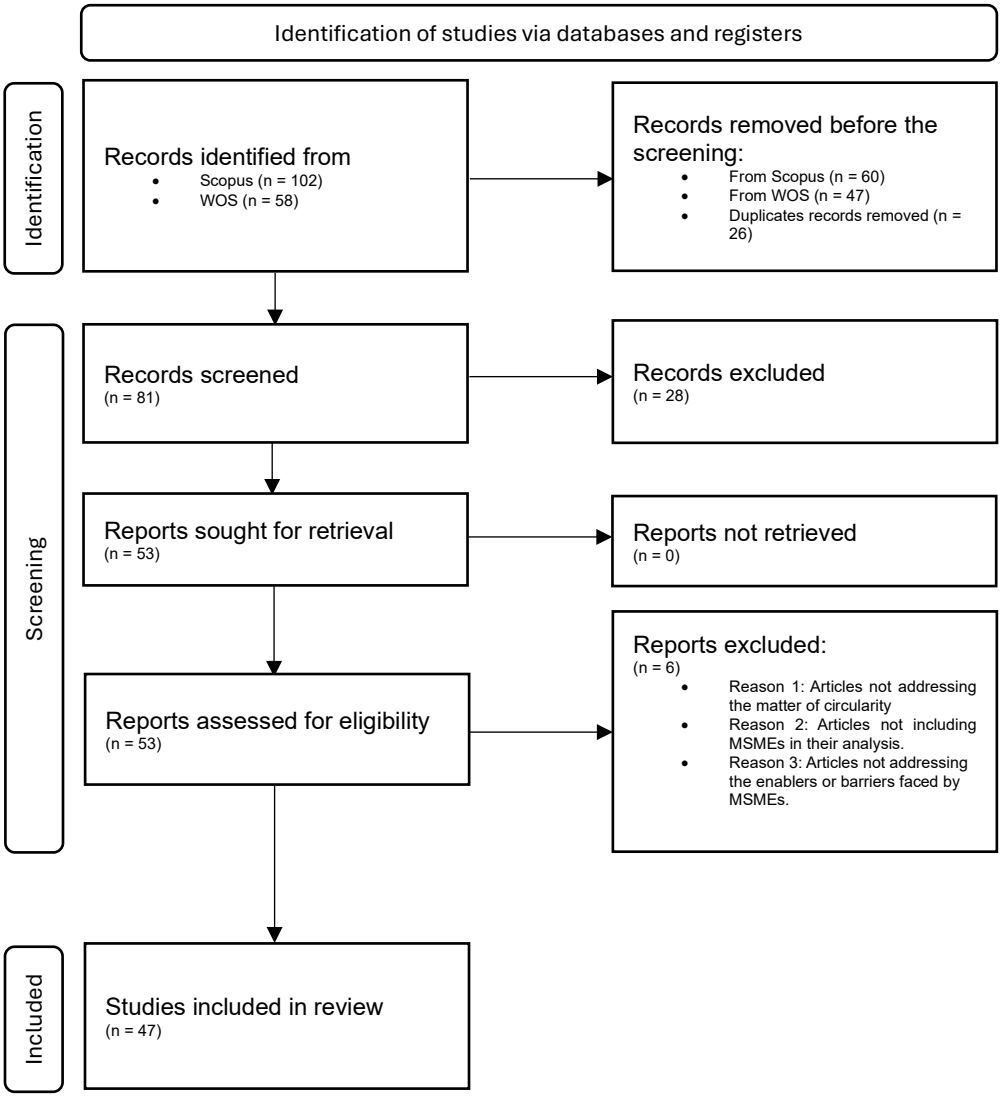
In an SLR, pre-defined search criteria are crucial for a transparent approach. The current SLR process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and produces scientific publication documents from Scopus and Web of Science databases to examine the barriers and enablers to adopting a CE in MSMEs, as both databases are regarded as the largest and most comprehensive in terms of covered journals (See Fig 1). Here, the study opted to search through keywords by topics (including titles, abstracts and keywords), using the following terms: ((“Circular Economy” OR “Closed loop economy” OR “Regenerative economy” OR “Material recycling” OR “Circular business economy” OR “Reuse of waste” OR “Circular consumption” OR “Circular production” OR “Circular economic cycle” OR “Circular system” OR “circularity”) AND (“MSME” OR “SME”) AND (“Enablers” OR “Facilitors” OR “Opportunities” OR “Drivers” OR “Promoters” OR “Barriers” OR “Challenges” OR “Hindrances” OR “Impediments” OR “Hurdles” OR “Roadblocks” OR “obstacles”)). However, our research is not limited to a certain time period; instead, it encompasses all relevant academic works.

3.2 Screening criteria for the study

The process of specifying the study comprises the establishment of the inclusion and exclusion criteria (see Table 1). Due to the higher likelihood of peer review with journals compared to other sources, including book chapters, reports, conference papers and notes, the current SLR exclusively included published articles.

Collectively, the studies we examined were either qualitative or quantitative, but they all concentrated on the implementation of CE principles and MSMEs. Furthermore, acknowledging the linguistic obstacle, we restricted our selection to articles exclusively written in the English language, as most academic journals are published in English.

Fig 1. SLR steps (adapted from PRISMA 2020)



Source: Authors' construct

Table 1. Inclusion and exclusion criteria in SLR

Inclusion criteria	Exclusion criteria
Articles written in English	Articles not written in English.
Published articles available in full-text	Editorial surveys, reports, book chapters, review papers, conference papers, working papers, notes and essays
Empirical studies	Articles that mention the CE but do not focus on the enablers or barriers faced by MSMEs to adopt CE practices
Articles focusing on the enablers and barriers to the adoption of CE practices in MSMEs	Duplicate articles

	Articles in the categories of "Economics, Econometrics and Finance", "Business Management and Accounting", "Environmental Science", "Social Sciences" in Scopus and "Environmental Science and Ecology", "Business Economics", and "Development Studies" in Web of Science.

166 *Source*: Authors' construct
167

168 ### *3.3 Data extraction*

169 We conducted our searches on the Scopus and Web of Science databases on 14 March 2024. Upon
170 applying our specified search parameters, a total of 160 items were identified from both databases.
171 A total of 102 publications were sourced from Scopus, while 58 papers were obtained from Web
172 of Science. No limitation was imposed on the time period of our study selection. Nevertheless, the
173 main analysis of previous research indicated that the implementation of CE practices in MSMEs
174 has been the subject of academic interest since 2016. Hence, the mentioned papers were published
175 between the years 2016 and 2024. The screening process was conducted in four distinct phases.

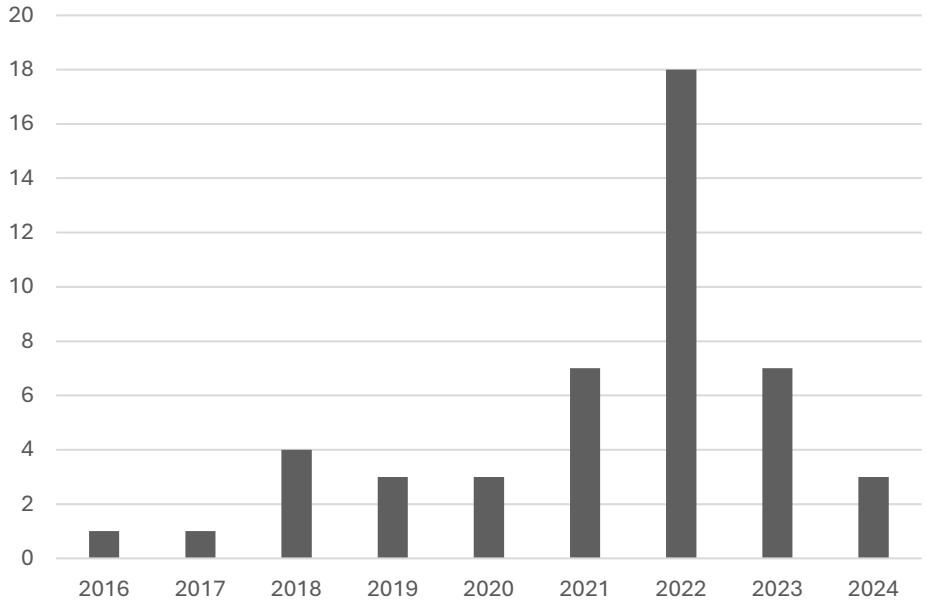
176 First, we eliminated editorial surveys, reports, book chapters, review papers, conference papers,
177 working papers, notes, essays, and articles not written in English. This selection resulted in 107
178 publications that were retained for further evaluation. Second, we eliminated duplicate articles as
179 certain publications previously accessible in Scopus were also present in the Web of Science.
180 Excluding duplicates, 81 studies were remaining for additional screening. Third, we used the
181 previously specified inclusion and exclusion criteria to screen the titles and abstracts of these 81
182 papers. Thus, the number of investigations remained at 53. After doing full-text screening, we
183 reviewed the remaining 53 papers and selected only those that specifically addressed the factors
184 that promote or hinder the adoption of CE in MSMEs. A total of 6 research were excluded, resulting
185 in a final sample of 47 papers.

186 ### *3.4 Data execution: Research profiling*

187 This section describes the research profile of the pool of studies in the sample. The results
188 presented in this section assess the extant research on the basis of year-wise publications and the
189 spread of studies according to source titles and distribution of publications as per countries'
190 economic status. Fig 2. displays the year-wise distribution of all 47 publications in the context of
191 the enablers and barriers to the adoption of CE practices in the MSMEs and reveals that this is a
192 recent phenomenon. The chart shows a significant increase in publications after 2020, indicating

a growing interest in the CE related explicitly to the MSME sector. The COVID-19 pandemic has heightened researchers' interest in discovering alternative and new methods to enhance productivity for the survival of MSMEs by employing the CE idea. The year 2022, showing the highest number of publications, indicates that this was a particularly active period for research in this area. However, by 2023, the field might have reached a saturation point where the most critical aspects had already been covered, leading to fewer new studies.

Fig 2. Year-wise distribution of publications (CE related to MSMEs)

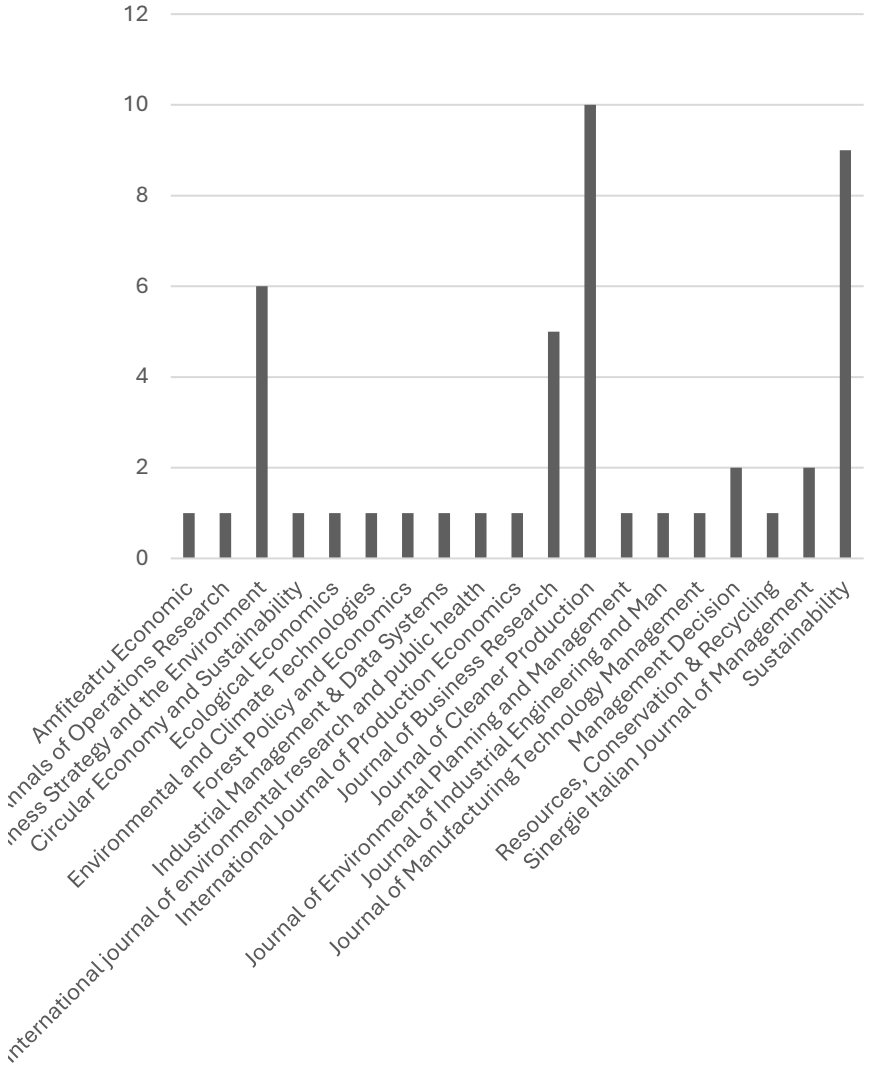


Source: Authors' construct.

Fig 3. shows the Journals with the most articles, the 'Journal of Cleaner Production' followed by 'Sustainability' with ten and nine publications, respectively. They were followed by 'Business Strategy and the Environment' and 'Journal of Business Research,' which had six and five publications, respectively.

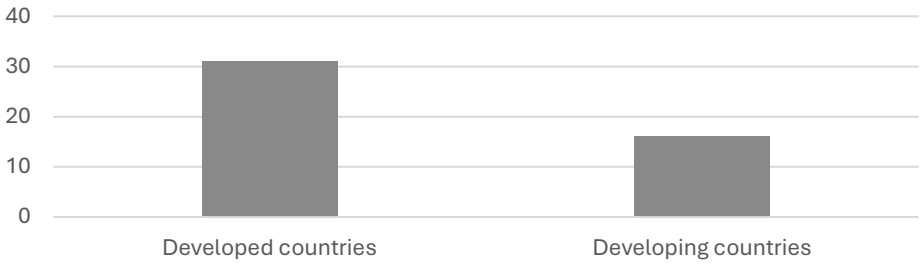
Fig 4. shows that a significant majority of the articles reviewed, 31, originate from developed nations, showcasing a robust research infrastructure and awareness regarding CE principles. Conversely, developing countries contribute 16 out of the reviewed literature. This stark imbalance underscores a critical gap in understanding and addressing CE adoption within MSMEs, particularly in regions with limited resources and infrastructure.

Fig 3. Distribution of publications (CE related to MSMEs) as per journal



Source: Authors' construct.

Fig 4. Publications distribution (CE related to MSMEs) per countries' economic status



Source: Authors' construct.

4 Content analysis

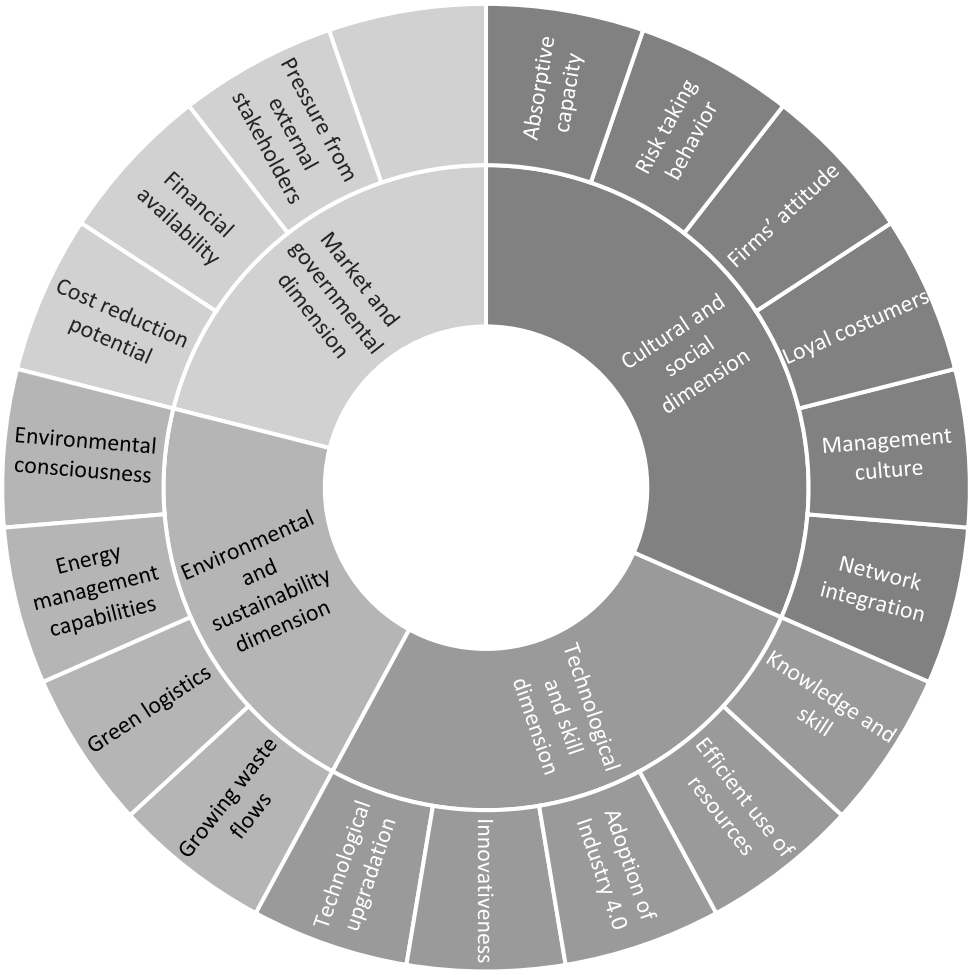
To carefully organise a wide range of studies, we fully evaluated all 47 papers to identify common themes. After a thorough presentation of the data, the subsequent phase involves conducting content analysis. This study has found various factors that facilitate or hinder the adoption of CE practices in the MSMEs sector. Furthermore, it categorises these factors in the context of developed and developing countries. The popularity and frequency of occurrence of such enablers and barriers in the article portfolio were also analysed to provide clarification. Those identified enablers and barriers were further segregated into four broad categories.

4.1 CE enablers

The implementation of CE practices by MSMEs is seen as crucial for the progress of both developed as well as developing countries. Therefore, it is essential to acknowledge and understand the underlying factors that drive CE practices (Govindan and Hasanagic, 2018). Hence, the study first analyses the factors that enable this process. A brief analysis of the enablers is displayed in Appendix Table A1. Among the 47 comprehensively analysed publications, 19 key enablers were identified. In order to guarantee the inclusion of only relevant factors, we exclusively focused on the enablers that emerged as having a significant impact on the implementation of CE principles in the MSMEs in the chosen publications.

The enablers have been categorised into four distinct categories based on the functional features of CE, considering their significance and commonalities (See Fig 5). Additionally, they have been categorised into internal and external environments. The internal level pertains to the tasks that need to be carried out within the firm, while the external level refers to the actions that need to be taken outside the enterprise to facilitate the adoption of CE by MSMEs. Out of a total of 19 enablers, 15 were associated with the internal environment, while the remaining four were linked to the external environment. This study also examined the popularity of CE enablers in MSMEs based on the frequency of their appearance in the article portfolio and segregated them into perspectives on developed and developing economies.

Fig 5. Deployment of CE enablers in MSMEs



Source: Authors' construct

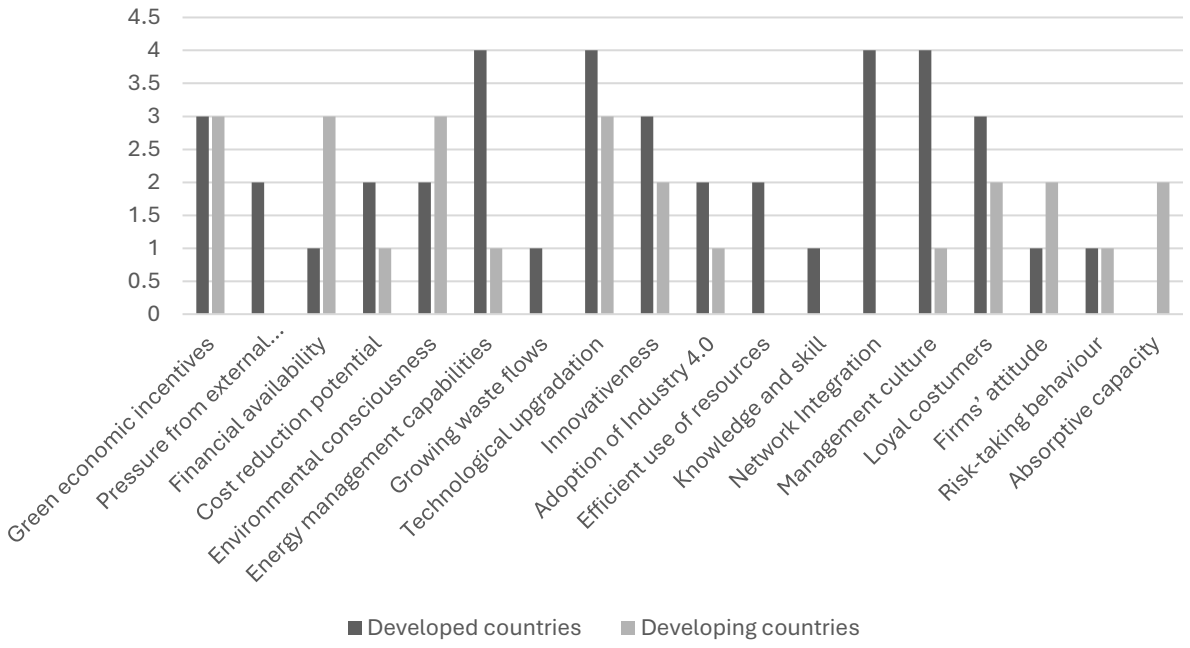
Market and governmental dimension: This cluster comprises various government and non-government incentives to promote the adoption of CE practices in MSMEs

MSMEs are conscious of the cost-saving possibilities associated with the circular business model, which is a crucial facilitator. Additionally, enterprises can gain a competitive edge by adopting this model (Briguglio *et al.*, 2021; John *et al.*, 2023). In this context, green economic incentives, which refer to advantages offered by governmental and non-governmental organisations for using green management techniques, appear among the most significant enablers (Chowdhury *et al.*, 2022; Moorthy *et al.*, 2012; Schmidt *et al.*, 2021). In their study, Singh *et al.* (2018) suggested that government subsidies and tax benefits, premium prices for green products and lower-cost recycled

raw materials can incentivise adopting a CE. As per Sohal *et al.* (2022), financial viability was identified as a critical factor driving the acceptance of the technologies that enable CE.*Environmental and Sustainability Dimension:* This cluster comprises various internal factors like the firms' consciousness of environmental issues and their ability to transition to sustainable and renewable energy sources.

In their study, Corsini *et al.* (2022) suggested that environmental concern is a pivotal factor in influencing environmental reasoning. The study conducted by Singh *et al.* (2018) demonstrates that environmentally sensitive entrepreneurs are more prepared to apply CE practices. The importance of environmental awareness among consumers can not be overstated since positive attitudes among employees and customers can drive demand for environmentally friendly products (Briguglio *et al.*, 2021; Kamal *et al.*, 2022; Muafi and Sugarindra, 2023). However, the main suggestion of a circular model is to reduce energy consumption and prevent any losses in closed-loop systems. This is because, as the law of entropy states, if energy is not recovered, the system will eventually require new resources to be refilled (Serrano-Arévalo *et al.*, 2024; Ünal *et al.*, 2018).

Fig 6. Frequency (publication numbers) of CE enablers



Source: Authors' construct.

Technological and skill dimension: This cluster encompasses several technological advancements, such as the implementation of Industry 4.0 and a focus on innovation to optimise resource utilisation.

To successfully implement a CE in MSMEs, it is crucial to have a well-defined investment policy that supports technological advancements and digitalisation (Rodrigues and Franco, 2023). Research suggests that larger firms are more inclined to invest in advanced technology than MSMEs (Dura *et al.*, 2022; Sohal *et al.*, 2022). According to the findings proposed by Demirel and Danisman (2019), except for investments in eco-design innovations, most circular eco-innovations do not contribute to the growth rates of MSMEs. Therefore, Findik *et al.* (2023), Rejeb *et al.* (2022), and Zheng *et al.* (2022) proposed the implementation of a strategy that incorporates Industry 4.0 components like big data, the Internet of Things (IoT), cloud computing, blockchain technologies, etc to enhance the competitiveness of MSMEs towards CE adoption.

Cultural and social dimension: This cluster focuses on the disposition of businesses and society towards embracing the CE model instead of the conventional linear approach.

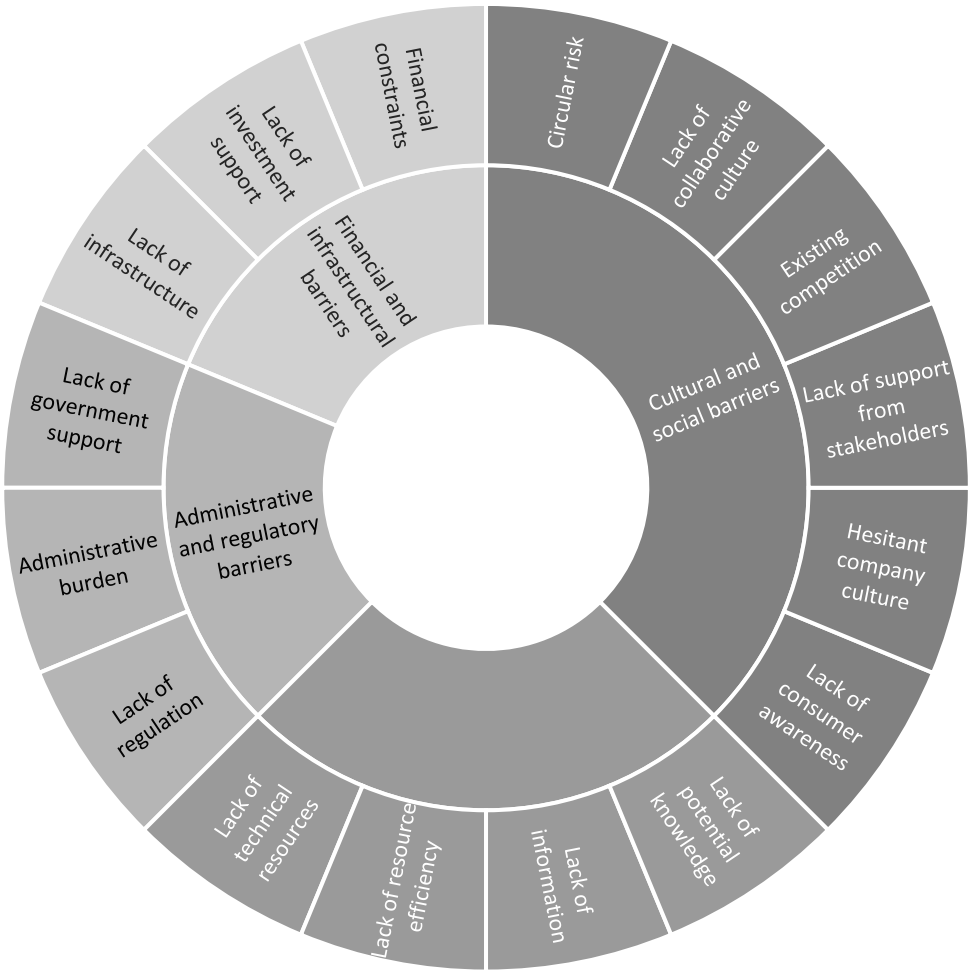
The commitment to environmental sustainability substantially impacts a company's adoption and implementation of sustainable waste management practices within their companies (Corsini *et al.*, 2022; Singh *et al.*, 2018). According to Rizos *et al.* (2016) and Scipioni *et al.* (2021), the organisational culture of employees and managers is often used as a facilitator in many MSMEs. According to Vihma and Moora (2020), freshly founded start-ups have an advantage in adopting CE ideas since they can build their corporate culture from scratch. Nevertheless, as per Ünal *et al.* (2018) and Vihma and Moora (2020), the value network and customer value proposition must collaborate to transmit value from the producer to the customer effectively. Therefore, customers must cultivate environmental consciousness among customers (Al-Awlaqi and Aamer, 2022; Briguglio *et al.*, 2021; Ünal *et al.*, 2018).

4.2 CE barriers

The shift towards CE practices presents many obstacles that could impede a firm's commitment to its effective adoption (García-Quevedo *et al.*, 2020; Malik *et al.*, 2022). Thus, to tackle our second research question, the study examines the barriers to this process as presented in Appendix Table A2. From a thorough analysis of 47 papers, 16 significant barriers were established. To ensure the

incorporation of only pertinent elements, we specifically concentrated on the barriers that were identified as having a substantial influence on the adoption of CE practices in the MSMEs mentioned in the selected publications. The barriers have been classified into four distinct groups, considering the functional characteristics of CE and their importance and similarities (See Fig 7). Furthermore, they have been classified into internal and external environments. Among a total of 16 barriers, seven were attributed to the internal environment, while the remaining nine were connected to the external environment. This study also analysed the prevalence of CE barriers in the MSMEs by assessing the frequency of their occurrence in the article portfolio in the context of both developed and developing countries separately.

Fig 7. Deployment of CE barriers in MSMEs



Source: Authors' construct

Financial and infrastructural barriers: This cluster encompasses the financial and economic obstacles associated with adopting CE practices in MSMEs.

The primary obstacle to implementing CE in SMEs is the lack of sufficient finance (Cavicchi *et al.*, 2022; Kafel and Nowicki, 2023; Mishra *et al.*, 2022; Virmani *et al.*, 2022). Financial institutions could develop tailored financing packages for MSMEs implementing sustainable manufacturing technology (Sohal *et al.*, 2022). According to the research conducted by Briguglio *et al.* (2021), financial institutions consider the unpredictability of the CE business model as a significant obstacle to making investments. Additionally, there is a shortage of infrastructure that supports environmentally conscious initiatives (Chakraborty *et al.*, 2023; Katsanakis *et al.*, 2023).

Administrative and Regulatory Barriers: This cluster includes a lack of adequate legislation to facilitate the implementation of CE, along with administrative burden. There exists insufficient coordinated government action to speed up the shift towards a CE (Chakraborty *et al.*, 2023; Kirchherr *et al.*, 2018). The regulatory authorities rarely provide technical support for offering recyclable solutions and industry-specific training programs on waste minimisation. 25% of the surveyed MSMEs identify the absence of government support as the primary obstacle to achieving a CE (Mishra *et al.*, 2022). This includes inadequate laws and insufficient assistance from local authorities (Ghenţa and Matei, 2018; Rizos *et al.*, 2016).

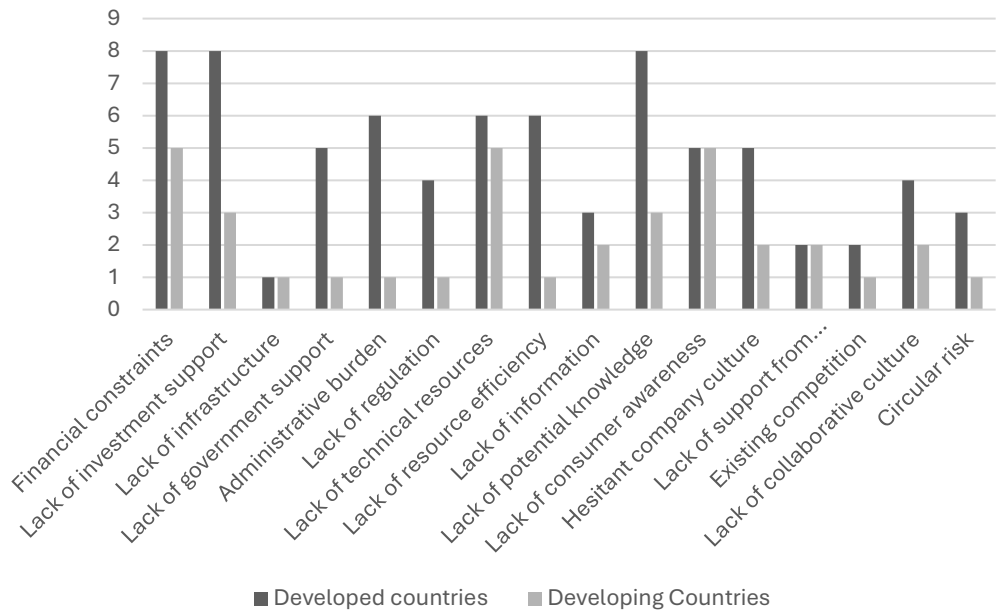
Technological and skills barriers: This cluster pertains to the obstacles related to technology constraints, inadequate information and probable knowledge gaps on the side of the firms.

Nevertheless, the lack of adequate skills and technical experience inside enterprises hinders the implementation of circular practices (Rizos *et al.*, 2016). According to the proposed findings (Briguglio *et al.*, 2021; John *et al.*, 2023; Mishra *et al.*, 2022; Scipioni and Niccolini, 2021; Virmani *et al.*, 2022), a lack of access to technology hampers energy efficiency, environmentally responsible corporate restructuring and the establishment of a CE. This was also highlighted by Cavicchi *et al.* (2022) and Despoudi *et al.* (2023).

Moreover, the literature indicates that there is a lack of effective implementation of sustainable resource management techniques and inadequate market mechanisms for the recovery process due to lack of potential knowledge (D'Amato *et al.*, 2020; Mishra *et al.*, 2022), which obstructs the

successful adoption of a CE in the MSME sector (de la Cuesta-González and Morales-García, 2022; Virmani *et al.*, 2022).

Fig 8. Frequency (publication numbers) of CE barriers



Source: Authors' construct

Cultural and Societal Barriers: This cluster pertains to the absence of enthusiasm in implementing the CE, the perspective of consumers towards reused products and the excitement of purchasing a new product.

Within enterprises, a significant challenge exists in a hesitant company culture (Kirchherr *et al.*, 2018). According to de la Cuesta-González and Morales-García (2022), the absence of external investment support owing to circular risk discourages entrepreneurs from embracing CE methods. The lack of dedication from the management system impedes the adoption of CE strategies, as highlighted by (Woodard, 2021). The presence of competition in the market prevents them from adopting a CE production technique (Briguglio *et al.*, 2021; John *et al.*, 2023) due to a pre-existing lack of consumer interest and understanding (Kirchherr *et al.*, 2018; Mishra *et al.*, 2022; Virmani *et al.*, 2022).

5 Results and discussion

The present SLR aims to identify the different factors that facilitate or hinder the successful application of CE in the MSMEs. Thus, we addressed two fundamental research questions. We tackled RQ1 by providing comprehensive data analysis of the existing literature, including the yearly patterns, sources of publishing and geographic scope of the works. We investigated RQ2 by identifying study themes that specifically examine the factors that promote or hinder the adoption of CE amongst MSMEs. In this section, the enablers and barriers presented in earlier sections will be discussed concerning both developed and developing countries' frameworks in Fig 6 and Fig 8.

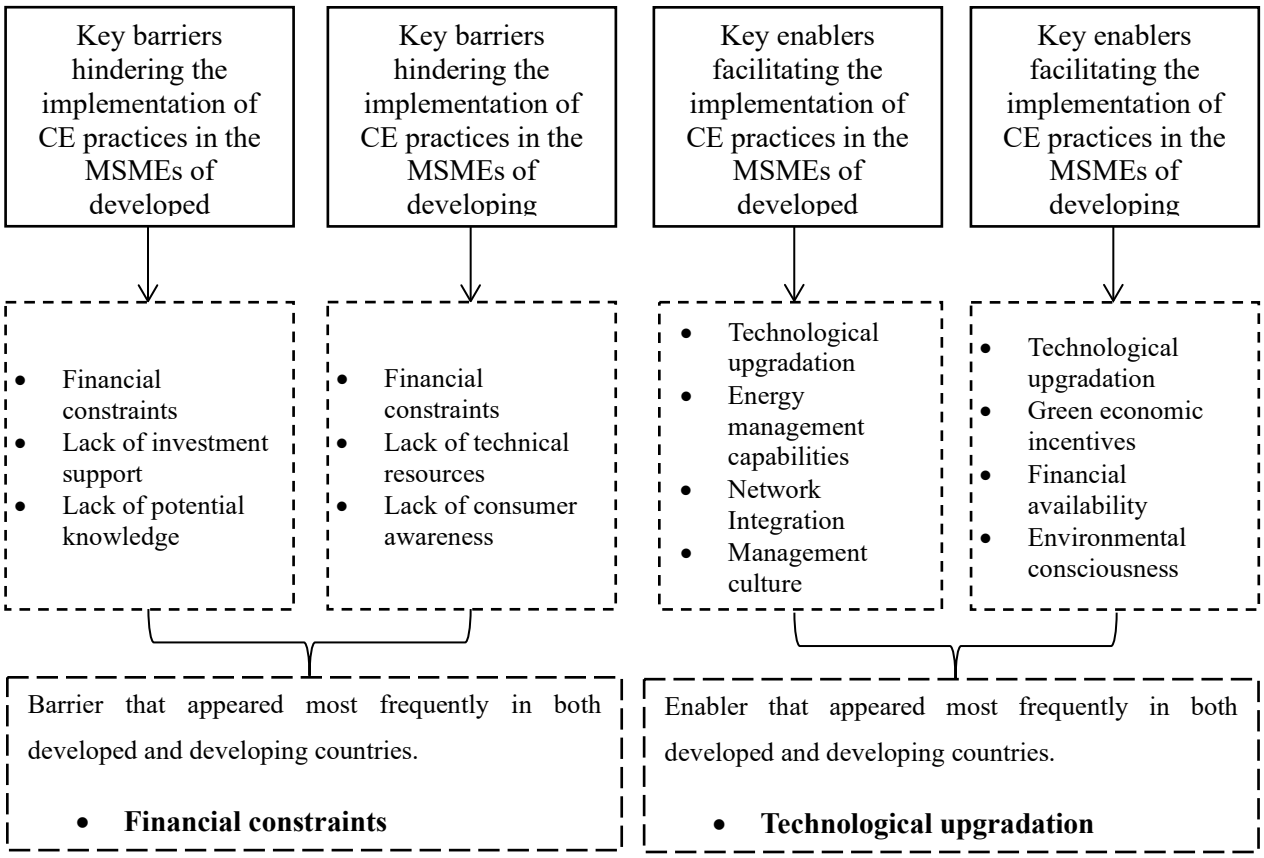
Key enablers facilitating the adoption of CE practices among MSMEs in developed countries: A systematic literature evaluation of 47 research found 19 significant enablers that encourage MSMEs to adopt CE practices. To improve our findings, we categorised these enablers by relevance to developed and developing countries, taking into account MSMEs' unique demands in each environment. According to our findings, four enablers are particularly important in developed countries. First, energy management capabilities to reduce energy use and environmental impact. Second, technical upgrades are needed to save resources and support CE. Third, network integration helps firms collaborate and share resources. Finally, management culture encourages the entire company to adopt CE principles. Because they appeared most frequently in the literature, these enablers were most important in advancing CE practices in developed nations.

Key enablers facilitating the adoption of CE practices among MSMEs in developing countries: The characteristics of MSMEs in developing countries differ from those in developed countries (Zahra *et al.*, 2006). As a result, the factors driving the adoption of CE practices in MSMEs from developing countries are likely to be quite different. Our study found that four key factors are particularly important for promoting CE practices among MSMEs in developing countries. First, green economic incentives as they provide financial motivation for businesses to adopt CE practices. The second is financial availability, and the third is environmental consciousness on the part of MSMEs and their stakeholders. Finally, technological upgradation allows businesses to modernise their processes. It is noteworthy that technological upgradation is a common enabler, as it also appears prominently in developed and developing countries.

Key barriers hindering the adoption of CE practices among MSMEs in developed countries: Our study identified several key barriers that MSMEs in developed countries face when trying to adopt CE practices. Financial constraints are a major obstacle, as these businesses often struggle to secure the necessary funds for implementing CE initiatives. Additionally, the lack of investment support compounds the problem. Another significant barrier is the lack of potential knowledge, as many MSMEs do not have access to the information needed to integrate CE principles effectively.

5.4 Key barriers hindering the adoption of CE practices among MSMEs in developing countries: For MSMEs in developing countries, the existing literature highlights several distinct barriers to adopting CE practices. The most prominent barriers include financial constraints, lack of technical resources and lack of consumer awareness. Notably, financial constraints are a significant barrier in both developed and developing countries, highlighting a common challenge faced by MSMEs. However, a visual representation of our key findings is presented in Fig 9.

Fig 9. Conceptual diagram showing main barriers and enablers for MSMEs in adopting CE practices



Source: Authors' construct.

6 Conclusion and policy implications

Although heavily praised for its significant contribution to economic growth, the MSME sector has faced widespread criticism for its lack of environmental concern, inefficient resource usage and insufficient adherence to environmental management programs (Dey *et al.*, 2022). In order to address this significant requirement, a comprehensive literature study of 47 papers was conducted to comprehend the notion of enablers and barriers to the implementation of CE in the MSME sector. In this particular context, a thorough examination has identified 19 factors that facilitate and 16 factors that hinder. The present study further classifies these factors based on the context of developed and developing countries. This study's findings have significant implications for both practitioners and academics interested in CE and its use in MSMEs. In conclusion, we outline the main practical and theoretical implications of this work.

6.1 Practical implications

This SLR has several practical implications for MSMEs and their stakeholders. First, it highlights the primary obstacles that hinder the adoption of CE practices. Through the categorisation of these within the framework of developed and developing economies, our comprehensive study enables MSMEs to predict several challenges when adopting CE. For example, external barriers such as financial constraints are the key inhibiting factors in CE implementation amongst the MSMEs of both developed and developing countries. In this regard, we recommend that MSMEs should adopt a collaborative approach with stakeholders while adopting the CE model to address budgetary limitations and enhance the effectiveness of the implementation process. Furthermore, governments should acknowledge the significance of CE and actively encourage fundraising to execute the CE paradigm.

Another substantial external barrier faced by the MSMEs of developed economies is the lack of investment support. In this regard, MSMEs should improve their business planning and financial literacy to attract investment and exploit technology and innovation for increased efficiency. Likewise, a significant internal barrier encountered by MSMEs in developed nations is the lack of potential knowledge to embrace CE principles. In order to tackle this issue, policymakers should prioritise the implementation of specialised education and training initiatives emphasising CE practices.

One of the major internal barriers faced by MSMEs in developing economies is the lack of technical resources. In order to tackle this issue, authorities should provide subsidised access to cutting-edge technology and specialised technical training programs designed for CE practices. Furthermore, a substantial external barrier they face is a lack of consumer awareness regarding circular products. In order to combat this issue, governments should prioritise awareness campaigns and initiatives that emphasise the advantages of sustainable consumption and CE practices.

Second**,** the study also highlights the primary enablers that facilitate the adoption of CE practices amongst MSMEs. For example, the study recognises technological upgradation, an internal enabler that has significant potential to facilitate CE adoption in the MSMEs of both developed and developing economies. Hence, to encourage the implementation of CE practices in MSMEs, governments can provide incentives such as subsidies or tax relief for investing in advanced and sustainable technologies.

Other internal enablers that encourage the adoption of CE practices in the MSMEs of developed economies are energy management capabilities, network integration and management culture. Thus, governments should prioritise energy management capacities by providing grants or subsidies for energy-efficient technologies and extensive training programs to promote CE practices in MSMEs. Industrial clusters and innovation hubs, which allow companies to share resources and expertise, can improve network integration. Leadership development programmes that emphasise sustainability and innovation help promote CE practices in management. Integrating these operations will create a coherent framework that allows MSMEs to adopt and benefit from CE concepts, encouraging sustainable growth in developed nations.

Another internal enabler that facilitates the adoption of CE practices in the MSMEs of developing countries is environmental consciousness on the part of the owner and other MSME stakeholders. So, It is recommended that policymakers implement educational initiatives that highlight the advantages of circular CE for both private enterprises and the environment. Apart from this, there are two external factors, namely green economic incentives and finance availability, that motivate MSMEs in developing countries to adopt CE practices. Therefore, our analysis proposes that governments should adopt strong green economic incentives, such as tax credits, subsidies and grants, carefully aimed at promoting sustainable technologies and practices. Furthermore,

improving the accessibility of finance by creating low-interest loans for CE initiatives can reduce the financial obstacles that many MSMEs encounter.

6.2 Theoretical implications

The notion of CE is crucial not just for MSMEs but also for society and the environment. Therefore, thorough research is necessary to direct policymakers and MSMEs to address the challenges and opportunities associated with the deployment of CE. First**,** the study presents the research profile of previous studies, including their geographical scope, annual publication trends and publication sources. Future scholars can further investigate these themes to advance theoretical knowledge in this field.

Second, the present study is one of the limited number of previous review studies that specifically examine the precise classification of the factors that facilitate or hinder the adoption of CE in MSMEs. Previous researchers have investigated the factors that facilitate or hinder progress in different specific areas, such as built environments (Hart *et al.*, 2019) and the construction industry (AlJaber *et al.*, 2023). However, these limited investigations only emphasise the need for a more comprehensive and inclusive evaluation of the current body of knowledge concerning the MSME sector. To fill this void, we conducted a thorough analysis of existing literature to identify the main factors that facilitate or hinder the implementation of CE in MSMEs.

Third**,** The present study has provided a comprehensive categorisation of the factors that facilitate or hinder progress, as well as the significant differences between developed and developing countries. Thus, comparative efforts will enhance the present understanding and enable policymakers to develop strategies and policies for CE accordingly**.**

6.3 Limitations

Our study provides a thorough assessment of the obstacles and motivators for MSMEs adopting CE standards, but it has some limitations. It relied exclusively on Scopus and Web of Science, so future research could benefit from exploring additional databases. The focus on empirical quantitative and qualitative studies may limit the scope, suggesting a broader inclusion of conference papers and project reports. Additionally, the review is restricted to literature published from 2016 to 2024, potentially overlooking earlier relevant research.

6.4 Future research scopes

In considering future research directions, several key areas emerge from our analysis: First, the results of our analysis indicate that financial constraints are the primary obstacle encountered by MSMEs in adopting CE practices, as they are the most commonly present obstacle in the article portfolio of both developed and developing countries. However, only a small number of research have addressed the different financial obstacles linked to CE implementation. In order to effectively overcome financial obstacles, it is necessary to conduct a thorough examination of these obstacles at the MSMEs level. Second, the analysis of our study indicates that technology upgradation is the primary factor that enables the successful application of CE practices in MSMEs which is found to be the most consistently present in of both developed and developing countries. In this context, future studies should prioritise the identification of particular technical skill- and expertise-related obstacles that MSMEs have while adopting CE practices, as the existing literature in this area is nascent.

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Appendix: Tables

Table A1. Enablers of CE adoption in MSMEs

Enablers	Description	Internal/ External	Reference
Market and governmental dimension			
E1. Green economic incentives	Governmental and non-governmental organisations in different countries offer several economic incentives like government subsidies and tax benefits, premium prices for green products, the use of lower-cost recycled raw materials, etc., for using green management techniques, which appeared as one of the most significant enablers of CE in MSMEs.	External	(Briguglio *et al.*, 2021; John *et al.*, 2023; Rizos *et al.*, 2016; Singh *et al.*, 2018; Sohal *et al.*, 2022; Salvioni et al., 2021)
E2. Pressure from external stakeholders	Suppliers and service partners should encourage firms to participate in CE processes, as their successful implementation requires collaboration from all parties throughout the supply chain.	External	(Rizos *et al.*, 2016; Scipioni and Niccolini, 2021)
E3. Financial availability	MSMEs often face a shortage of financial resources that hinders their ability to make early investments and engage in the innovation necessary to implement CE practices. Financial viability has been established as a crucial determining element in this context.	External	(Rizos *et al.,* 2016; Sohal *et al.,* 2022; Mathivathanan *et al.,* 2022; Cantú *et al.,* 2021)
E4. Cost reduction potential	Firms get a competitive advantage due to the cost reduction potential on the part of the CE business model.	Internal	(Briguglio *et al.*, 2021; John *et al.*, 2023; Salvioni *et al.,* 2021)
Environmental and sustainability dimension			
E5. Environmental consciousness	The enterprises' environmental consciousness indicates their commitment and preparedness to adopt environment-friendly production approaches, which is a pivotal factor in influencing environmental reasoning.	Internal	(Briguglio *et al.*, 2021; Corsini *et al.*, 2022; Kamal *et al.*, 2022; Singh *et al.*, 2018; Mathivathanan *et al.,* 2022)
E6. Energy management capabilities	Energy management not only promotes an energy-conscious organisational culture but also enhances the comprehension and implementation of CE business models.	Internal	(Cavicchi *et al.*, 2022; D'Amato *et al.*, 2020; Serrano-Arévalo *et al.*, 2024; Sohal *et al.*, 2022; Ünal *et al.*, 2018)
E8. Growing waste flows	Growing waste flows can drive MSMEs to adopt CE practices by increasing resource scarcity, regulatory pressures, and cost-saving potential.	Internal	(Briguglio *et al.*, 2021)
Technological and skill dimension			
E9. Technological upgradation	Adopting advanced technology to achieve cleaner manufacturing practices promotes the CE business model and enhances the economic and environmental sustainability of the company.	Internal	(Cavicchi *et al.*, 2022; Dura *et al.*, 2022; Scipioni and Niccolini, 2021; Sohal *et al.*, 2022; Mathivathanan *et al.,* 2022; Chakraborty *et al.,* 2022; Cantú *et al.,* 2021)
E10. Innovativeness	MSMEs can enhance their innovation by reimagining their goods to possess more durability and recyclability. This enables MSMEs to embrace novel technologies that facilitate the implementation of CE practices.	Internal	(Al-Awlaqi and Aamer, 2022; Demirel and Danisman, 2019; Rodrigues and Franco, 2023; Vihma and Moora, 2020; Chowdhury *et al.,* 2022)

E11. Adoption of Industry 4.0	Implementation of a strategic approach that integrates Industry 4.0 elements such as big data, the Internet of Things (IoT), cyber-physical systems, 3D printing, cloud computing, blockchain technologies, etc., can improve the capabilities of MSMEs to adopt CE practices.	Internal	(Findik *et al.*, 2023; Suchek *et al.*, 2023; Zheng *et al.*, 2022)
E12. Efficient use of resources	Efficient resource use reduces costs and waste, making CE practices more viable for MSMEs...	Internal	(Holzer *et al.*, 2021; Chakraborty *et al.,* 2022)
E13. Knowledge and skill	MSMEs should have a solid understanding of CE principles, including waste reduction, resource efficiency, product life extension, and closed-loop systems.	Internal	(Vihma and Moora, 2020)
Cultural and social dimensions			
E14. Network Integration	Due to limited resources and expertise, MSMEs need a network of partners to create circular designs and creative products. The value network and customer value proposition must work together to transfer producer value to the customer.	Internal	(Rizos *et al.*, 2016; Scipioni *et al.*, 2021; Ünal *et al.*, 2018; Vihma and Moora, 2020)
E15. Management culture	The impression of the adoption of a CE is contingent upon the manager's anticipation of either positive or negative outcomes. The organisational culture of employees and managers is frequently utilised as a catalyst in numerous MSMEs.	Internal	(Rizos *et al.*, 2016; Scipioni *et al.*, 2021; Vihma and Moora, 2020; Chakraborty *et al.,* 2022; Chowdhury *et al.,* 2022)
E16. Loyal costumers	Customer engagement in circular initiatives is essential, as they are the proprietors of the product and hold the accountability for its use.	External	(Briguglio *et al.*, 2021; Rizos *et al.*, 2016; Scipioni and Niccolini, 2021; Ünal *et al.*, 2018; Mathivathanan *et al.,* 2022; Cantú *et al.,* 2021)
E17. Firms' attitude	The amount to which a firm owner anticipates favourable or negative results dictates their CE implementation attitude, which strongly affects a company's environmental sustainability and leads to sustainable waste management.	Internal	(Corsini *et al.*, 2022; Malik *et al.*, 2022; Singh *et al.*, 2018)
E18. Risk-taking behaviour	Risk-taking refers to the capacity to make strategic choices and capitalise on potential chances in situations when the potential outcomes are unpredictable, which significantly affects the adoption of a CE business model.	Internal	(Al-Awlaqi and Aamer, 2022; Dura *et al.*, 2022)
E19. Absorptive capacity	. It improves the capacity of MSMEs to comprehend, embrace and execute CE principles, thereby enabling them to achieve the environmental, social and economic advantages linked to a CE.	Internal	(Muafi and Sugarindra, 2023; Cantú *et al.,* 2021)

Source: Authors's review

Table A2. Barriers to CE adoption in MSMEs

carriers	Barriers	Description	Internal/ External	Reference
Financial and infrastructural barriers				
	B1. Financial constraints	Funding is the biggest obstacle to CE in MSMEs. Financial institutions should tailor financing to MSMEs utilising sustainable manufacturing technology.	External	(Cavicchi *et al.*, 2022; de la Cuesta-González and Morales-García, 2022; Demirel and Danisman, 2019; Kafel and Nowicki, 2023; Mishra *et al.*, 2022; Rizos *et al.*, 2016; Sohal *et al.*, 2022; Virmani *et al.*, 2022; Ormazabal *et al.,* 2018; Chakraborty *et al.,* 2022; Sharma *et al.,* 2021; Garcés-Ayerbe *et al.,* 2019; Saharan *et al.,* 2023)
	B2. Lack of investment support	MSMEs struggle to get traditional types of finance like bank loans due to factors like little collateral and bad credit, which prohibit them from implementing sustainable business methods.	External	(Briguglio *et al.*, 2021; de la Cuesta-González and Morales-García, 2022; Saharan *et al.,* 2023; García-Quevedo *et al.,* 2020; Ormazabal *et al.,* 2018; Palombi *et al.,* 2024; Salvioni *et al.,* 2021; Cantú *et al.,* 2021; Ghenţa *et al.,* 2018; Sharma *et al.,* 2021; Garcés-Ayerbe *et al.,* 2019)
	B3. Lack of infrastructure	MSMEs' limited infrastructure can hinder CE practices, limiting their ability to maximise resource utilisation and adopt more sustainable business strategies.	External	(Briguglio *et al.*, 2021; John *et al.*, 2023,)
Administrative and regulatory barriers				
	B4. Lack of government support	The regulatory authorities seldom offer technical assistance for developing recyclable solutions and industry-specific training programs focused on waste reduction. This acts as a significant barrier to attaining a CE in MSMEs.	External	(Kirchherr *et al.*, 2018; Mishra *et al.*, 2022; Rizos *et al.*, 2016; Ormazabal *et al.,* 2018; Palombi *et al.,* 2024; Salvioni *et al.,* 2021)
	B5. Administrative burden	Administrative expenditures make CE adoption difficult for MSMEs.	External	(Rizos *et al.*, 2016; García-Quevedo *et al.,* 2020; Salvioni *et al.,* 2021; Ghenţa *et al.,* 2018; Takacs *et al.,* 2022; Garcés-Ayerbe *et al.,* 2019)
	B6. Lack of regulation	A lack of regulations can hinder the adoption of CE in MSMEs by creating uncertainty and limiting incentives for investment in sustainable practices, as MSMEs may lack clear guidelines to implement CE strategies effectively.	External	(Briguglio *et al.*, 2021; García-Quevedo *et al.,* 2020; Palombi *et al.,* 2024; Takacs *et al.,* 2022)
Technological and skill barriers				
	B7. Lack of technical resources	Incorporating sustainable production and consumption technologies is necessary to convert a linear business model into a circular business model. However, a lack of skills and experience inside organisations hinders the adoption of CE.	Internal	(Briguglio *et al.*, 2021; Cavicchi *et al.*, 2022; John *et al.*, 2023; Mishra *et al.*, 2022; Rizos *et al.*, 2016; Scipioni and Niccolini, 2021; Virmani *et al.*, 2022; Ormazabal *et al.,* 2018; Cantú *et al.,* 2021; Sharma *et al.,* 2021; Takacs *et al.,* 2022)

	B8. Lack of resource efficiency	the literature shows that sustainable resource management and recovery market mechanisms are lacking and hinder MSME CE implementation.	Internal	(de la Cuesta-González and Morales-García, 2022; Kafel and Nowicki, 2023; Virmani *et al.*, 2022; García-Quevedo *et al.,* 2020; Palombi *et al.,* 2024; Arranz *et al.,* 2024; Takacs *et al.,* 2022)
	B9. Lack of information	Due to time and money constraints, MSMEs may not realise how CE may improve their skills and business operations.	Internal	(Briguglio *et al.*, 2021; John *et al.*, 2023; Ormazabal *et al.,* 2018; Palombi *et al.,* 2024, Cantú *et al.,* 2021)
	B10. Lack of potential knowledge	Some MSMEs may not understand the differences between CE and linear business models or their potential benefits. A fear of overhauling their company operations may explain this lack of knowledge.	Internal	(Mishra *et al.*, 2022; Saharan *et al.,* 2023; García-Quevedo *et al.,* 2020; Chakraborty *et al.,* 2024; Palombi *et al.,* 2024; Salvioni *et al.,* 2021; Arranz *et al.,* 2024; Ghenţa *et al.,* 2018; Sharma *et al.,* 2021; Takacs *et al.,* 2022; Garcés-Ayerbe *et al.,* 2019)
Cultural and social barriers				
	B11. Lack of consumer awareness	Consumers' lack of awareness about sustainable products affects firms' willingness to implement CE practices.	External	(Kirchherr *et al.*, 2018; Mishra *et al.*, 2022; Virmani *et al.*, 2022; Saharan *et al.,* 2023; Ormazabal *et al.,* 2018; Chakraborty *et al.,* 2022; Palombi *et al.,* 2024; Cantú *et al.,* 2021; Sharma *et al.,* 2021; Takacs et al., 2022)
	B12. Hesitant company culture	CE concepts require a major shift in attitude and corporate strategy, which may be met with resistance from employees and management who prefer risk avoidance over innovation.	Internal	(de la Cuesta-González and Morales-García, 2022; Kirchherr *et al.*, 2018; Woodard, 2021; Saharan *et al.,* 2023; Chakraborty *et al.,* 2022; Palombi *et al.,* 2024; Sharma *et al.,* 2021)
	B13. Lack of support from stakeholders	MSMEs may prioritise short-term profits over sustainability if demand for sustainable products and services is insufficient. Insufficient supplier assistance might also hinder sustainable input and reuse.	External	(Rizos *et al.*, 2016; Virmani *et al.*, 2022; Saharan *et al.,* 2023; Palombi *et al.,* 2024)
	B14. Existing competition	In competitive markets, MSMEs may face pressure to keep costs low. Also, they may struggle to differentiate their products or services only on sustainability.	External	(Briguglio *et al.*, 2021; John *et al.*, 2023; Takacs *et al.,* 2022)
	B15. Lack of collaborative culture	MSMEs without a collaborative culture may struggle to engage with suppliers, consumers and other stakeholders to discover and implement circular solutions.	Internal	(Mishra *et al.*, 2022; Scipioni and Niccolini, 2021; Palombi *et al.,* 2024; Arranz *et al.,* 2024; Sharma *et al.,* 2021; Takacs *et al.,* 2022)
	B16. Circular risk	Circular risk refers to the potential challenges and uncertainties that MSMEs may face when transitioning to CE practices.	Internal	(de la Cuesta-González and Morales-García, 2022; Palombi *et al.,* 2024; Takacs *et al.,* 2022)

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