

Review

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Review

Business Transformation Towards Circular Economy: A Systematic Literature Review and Prospects for Future Research

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Abstract: The growing global interest in Circular Economy (CE) adoption by organizations has received considerable attention in academic literature. This review delves into the multifaceted aspects of CE transformation, assessing barriers, drivers, and potential research directions. It encompasses three main clusters: frameworks and definitions, barriers and drivers, and industry-specific research. Existing studies significantly contribute by unveiling strategies, frameworks, and innovative approaches aiding CE transition. However, there's a notable focus on identifying barriers hindering CE implementation, revealing a critical need for effective solutions. Moreover, the review highlights the lack of CE frameworks in the service sector and insufficient awareness among Small and Medium Enterprises, necessitating deeper exploration. Despite the potential of digital technologies like Industry 4.0 in expediting CE transformation, comprehensive implementation strategies remain lacking. Noteworthy frameworks, such as circular business models and two-stage transformation models, offer practical pathways for CE adoption. Dynamic capabilities emerge as a crucial yet underexplored factor facilitating CE transition. Future research should delve into country-specific contexts, integrate digital technologies into industries, and explore the relationship between dynamic capabilities and CE transformation, especially within small and medium-sized enterprises. While progress has been made in understanding CE principles' adoption, this review highlights research gaps that require attention for global sustainability and widespread CE practice implementation.

Keywords: circular economy; industry 4.0; literature review; SMEs; barriers

1. Introduction and literature review

In recent years, there has been a significant increase in global interest in the concept of a CE (1–3). The term “Circular Economy” was introduced by Pearce and Turner in 1990 (4). However, it gained widespread recognition among the general public since 2012, primarily due to the efforts of the Ellen MacArthur Foundation (5) Also, (6) can take credit for introducing the concept of the CE earlier, describing it as a self-replenishing system that minimizes material and energy input while preventing environmental deterioration, without impeding growth and progress. There are several definitions for CE introduced by scholars. (7) define CE as a business model that necessitates a shift in thinking and conducting business operations. (8) defined CE as “an economic model aimed at the efficient use of resources through waste minimization, long-term value retention, reduction of primary resources, and closed loops of products, product parts, and materials within the boundaries of environmental protection and socioeconomic benefits,” (9) after reviewing 114 CE definitions stated CE as “an economic system that is based on business models which replace the ‘end of life’ concept with reducing, alternately reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the Micro level (products, companies and consumers), Meso level (eco-industrial parks) and Macro level (city, region, national and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity, and social equity, to the benefit of current and future generations.”

Even though there are different definitions for CE, the core understanding of CE is similar and is around this concept: “a closed loop of material and resources.” (10–13) Moving toward sustainability is the new mission of every organization in the modern world. The CE has taken the attention of every new organization that wants to capture and create a new and more sustainable place in the economy. Implementing a CE is a novel and effective strategy for promoting sustainability by actively reducing resource waste and emissions (14). CE business models have not yet become widely used or put into practice. This can be explained by the existence of different barriers that businesses encounter and understand during the creation and application of such models (15). It is essential to emphasize the importance of implementation, given that organizations face numerous obstacles when attempting to adopt CE business models. Several scholars investigate different barriers and challenges that organizations face during the development and implementation of CE practices (16–19) Understanding these barriers is as important as implementing the CE practices (Rizos et al., 2016). (21) study explore the capabilities that enable apparel brands to move past their traditional ties to linear economic models and, ultimately, to circular business models (CBMs), the results of their study concluded that, in response to the research question, established companies’ ability to switch to CBMs is influenced by a number of variables, including their reliance on their current product portfolio, adherence to a product-oriented business model, and their place in the supply chain. The extent to which changes can be made to product segments, target audiences, price points, and brand perception is constrained by these factors. Dependence on the currently available product portfolio, while it may improve economic performance, may not always be consistent with ecological and sustainable goals. (22) examine the strategies employed by manufacturing firms to facilitate a comprehensive transformation across the ecosystem towards the CE paradigm, their findings show that small and medium-sized businesses (SMEs) understand how crucial it is for the manufacturing sector to adopt CE practices in order to be long-term sustainable; CE adoption is seen as a way to reduce harmful environmental effects and promote sustainable development. Moving forward, (23), most recently looked into the impact of three key factors on the adoption of CE practices within service organizations: “institutional factors,” “contextual factors,” and “strategic factors.” It also investigates the implications of these factors for achieving long-term service provision. Nevertheless, a substantial gap remains in understanding the process of CE transformation within businesses. (24) investigated the “lack of mature and integrated regulatory environment” in CE transformation, Lack of public interest (25), Ownership issues in the supply chain (26), Lack of top management commitment (27), Lack of awareness (27,28), Complex product composition and configuration (28) and Weak legislation and law enforcement (29). While the majority of extant research on CE is conceptual in nature, there are a few studies that have looked into the practical applications of implementing CE practices, especially for SMEs (30).

There are several factors facilitating the CE transformation which have been studied in different articles. (31) argues that technological advancements and the process of digital transformation have the potential to facilitate the transition to a CE and significantly enhance product lifecycle management across supply chains. The fourth industrial revolution, often known as Industry 4.0 (I4.0), has recently introduced key innovations such as big data, the Internet of Things (IoT), and blockchain, These technical advancements have the potential to merge the virtual and physical domains, allowing access to data that changes rapidly and significantly contribute to the development and implementation of CE business models (32). More specifically, (33,34) state that the IoT stands out as one of the most extensively adopted technologies for enabling the transition towards a CE by firms. This is primarily due to the numerous opportunities it presents, such as facilitating interaction, cooperation, data collection, and exchange through wireless telecommunications. Additionally, cybersecurity and blockchain have gained significant attention in the context of the circular transition, these technologies offer valuable capabilities in ensuring transparency and safeguarding the cyber environment by providing enhanced protection, they create an environment conducive to internal and external communication, thereby facilitating collaboration among various stakeholders within industrial systems (35–38).

As we discussed, I4.0 technologies can facilitate the CE transformation, however, we should consider the barriers related to I4.0 technologies implementation, also known as “digitalization barriers.” A number of studies have identified and investigated the challenges preventing the effective application of digitalization technology. In-depth policy-related topics have also been covered in the literature, along with the significance of international forums, highlighting the necessity for local governments to address these issues appropriately (36). According to (39) due to the negative effects of disruptive technologies, the adoption of digitalization technologies that support the CE faces difficulties. Unpredictability, psychological problems, and information susceptibility are some of these effects. The broad deployment of digitalization technologies in the context of CE is hampered by these elements.

Moreover, (40) identified the absence of well-defined data management processes and the challenges associated with developing IoT-enabled products as significant barriers to the adoption of digitalization technologies in the context of the CE transformation. An uncooperative culture towards environmental issues, financial barriers, limited government support, administrative burdens, lack of information and technical skills, as well as inadequate support from the supply and demand network were stated as challenges and barriers to CE transformation in the study of (41). While the adoption of I4.0 holds theoretical potential for supporting the transition to a CE (42), it is important to note that the specific requirements and conditions for its effective implementation are not yet fully established or comprehensively understood (43).

Given the evolving nature of CE transformation, there remains a need for a deeper exploration of its operationalization. Consequently, the objective of this article is to contribute to the discourse by advancing the discussion on assessing CE transformations. By providing a comprehensive study of multi-sectoral studies relevant to CE transition, this review adds to the current body of literature on transformations. The goal is to evaluate how these studies evaluate CE changes and to combine the data to generate future research questions. The decision to focus on multi-sectoral transformations is motivated by the recognition that a comprehensive and sustainable CE requires ensuring that changes implemented in one sector do not have negative consequences in other sectors or impede progress in other aspects of CE transformation.

Our particular interest lies in examining the findings in recent articles, as it pertains to the operationalization of CE transformation. This focus allows us to explore the methods used in assessing fundamental change within academic literature. Evaluating the multidimensional nature of CE transformation poses significant challenges. Consequently, it is crucial to emphasize scientific methods and findings when assessing such changes. To guide our analysis, we formulate the following three research questions:

- What has been studied to transform businesses toward CE implementation?
- What are the barriers and drivers for CE transformation?
- What potential future research avenues are available to further advance our understanding in this area?

2. Methodology

Systematic literature reviews (SLR) have evolved as popular techniques for tracking the evolution of dynamically changing fields of study (44). We searched for articles in the Scopus and Google scholar databases.

In our search, we employed combinations of terms related to CE, transformation, and their close synonyms in the titles, abstracts, or keywords of the articles. We narrowed down the document type to include only finished research articles and review articles, excluding conference papers and book chapters. Furthermore, to enhance the quality of our research, we specifically examined high-quality journals classified by the “Associazione Italiana Insegnanti di Geografia (AIIG),” also known as “The Italian Association of Management Engineering.” Within this classification, we focused on “SILVER,” “GOLD,” and “GOLD STAR” journals to identify relevant articles pertaining to CE transformation. Our search in the databases yielded a total of 1070 articles published between 2018 and 2023. After excluding articles that did not explicitly focus on the transformation process or were unrelated to the

“barriers,” “drivers,” and “strategies” of the transformation process, the initial number of articles was reduced to 461.

Table 1. shows the search topics and the journals used for the literature review.

Database	Scopus And Google scholar
Search terms	(TITLE-ABS-KEY (“circular economy” AND “transformation”) OR TITLE-ABS-KEY (“circular economy” AND “transition”) OR TITLE-ABS-KEY (“circular economy” AND “adoption”))
Included journals	Journal Of Cleaner Production, Resources Conservation And Recycling, Sustainable Production And Consumption, Business Strategy And The Environment, Science Of The Total Environment, Journal Of Environmental Management, Waste Management, Journal Of Industrial Ecology, Renewable And Sustainable Energy Reviews, Technological Forecasting And Social Change, International Journal Of Production Economics, Journal Of Business Research, Ecological Economics, Resources Policy, International Journal Of Production Research, Environmental Innovation And Societal Transitions, Management Decision, Applied Energy, Energy, Corporate Social Responsibility And Environmental Management, Renewable Energy, Production Planning And Control, International Journal Of Logistics Management, Industrial Marketing Management, Forest Policy And Economics, Trends In Food Science And Technology, Industrial Management And Data Systems, Global Environmental Change, Environmental Science And Policy, Energy Conversion And Management, Transportation Research Part E Logistics And Transportation Review, Journal Of Manufacturing Systems, Construction Management And Economics, Energy Policy, Energy Research And Social Science, Cities, sustainability
Article types included	Finished research articles and reviews

Source: Authors

After reviewing the initial 461 articles, we checked their aims and findings to refine the literature database. As a result, we narrowed down the selection to 100 articles that explicitly focused on studying the transformation process and exploring how organizations can transition toward CE business models and practices. We conducted an examination of the selected 100 articles, specifically focusing on the methods utilized, the industries they targeted, as well as their limitations, and future research directions. This comprehensive analysis provided us with valuable insights into the methodological approaches employed, the specific industries that were the subject of study, and the identified limitations of the research. Furthermore, it sheds light on potential avenues for future research in the field of CE transformation.

3. Results

During the analysis process, a thorough examination was conducted of the findings and methodological approaches employed in the studies, as well as the specific contexts in which they were conducted. This comprehensive review aimed to deepen our understanding of the underlying foundations and premises on which these studies were built. Additionally, it facilitated the evaluation of any gaps that may exist in the current literature on CE transformation.

We first classified the 100 articles based on their keywords and primary areas of study. Following that, we categorized the articles in order to determine their primary goals. As a result of this process, three distinct clusters developed. The first cluster included articles that examined and defined frameworks for transferring to CE and CE business models, as well as discussions on CE definitions and practical implementation. The second cluster of articles investigated the challenges

and opportunities associated with the adoption and implementation of CE. These articles concentrated on the barriers and drivers of implementing CE practices. Finally, the third cluster included articles that focused on specific sectors or detailed aspects of CE transformation. These articles included in-depth analyses, specific case studies, examinations of specific industries, and the application of specific theoretical lenses.

3.1. First Cluster (*Frameworks and Definitions*)

Once we completed the categorization of the articles, our investigation revealed that a substantial portion of the articles, to be precise, 47 out of the total 100, primarily focused on providing frameworks and strategies to assist organizations in transitioning towards a more sustainable and circular economic model. Within this noteworthy cluster, we encountered a rich tapestry of research and innovative ideas that sought to revolutionize conventional practices and drive a paradigm shift towards a more regenerative and restorative economic approach. Among our research collection, several articles caught our attention due to their pioneering approaches and significant contributions to the field. For instance, (45) discussed the sustainability performance of the CBMs and circular supply chains necessary to implement the concept on an organizational level and proposed a framework to integrate CBMs and circular supply chain management towards sustainable development. (46) investigated the process of CBM transformation within established companies. The study focused on understanding how incumbent firms can effectively embark on the journey of transitioning their conventional business models into circular ones. As a result of this comprehensive research, the authors presented a detailed roadmap that serves as a practical guide for these firms in their endeavor to embrace and implement CBMs. This roadmap offers invaluable insights and actionable steps, facilitating a smooth and successful transformation towards a more sustainable and circular approach to conducting business. (47) shed light on the significance of “internationalization” and “digitalization” in driving sustainability transformation for SMEs. Their study investigated the influence of AI readiness on the international performance of these enterprises, as well as the interplay between digitalization, internationalization, and sustainability readiness. Their findings demonstrated that a higher level of AI readiness has a positive impact on the international performance of SMEs. Furthermore, the authors discovered a positive correlation between digitalization efforts and sustainability initiatives. However, an interesting revelation emerged, revealing that when SMEs embark on the path of internationalization, digitalization, and sustainability tend to diverge as competing growth trajectories (47). (48) provided a framework composed of particular skills, processes, and organizational activities that underline sensing, seizing, and reconfiguring dynamic capabilities of the organization. By focusing on dynamic capabilities firms can seek CE opportunities much more smother (48,49). To better understand the role of digitalization and I4.0 technologies in CE transformation we can refer to the recent research by (36), the authors revealed that that IoT and AI play a pivotal role in the transition towards the CE. Through an exhaustive examination of existing literature, they developed a comprehensive systems-based framework that leverages digitalization to enable the adoption of CE principles. This framework establishes meaningful connections among various research streams, offering novel insights into realizing the benefits of CE. By employing the Viable Systems Model (VSM), the developed framework sheds light on the intricate dynamics of multi-sectoral systems, underscoring the necessity for adaptive and streamlined approaches to address the ever-changing environment influenced by dynamic barriers and enablers, thereby rendering decision-making complex (36). The VSM framework facilitates constructive dialogues regarding feasible policy interventions and expected strategic outcomes. The authors concluded that the transformation towards CE adoption, driven by diverse technologies, necessitates a comprehensive overhaul of all elements of business models, encompassing how firms create, capture, and deliver value in alignment with CE principles. Besides what has been discussed till now, there are several numbers of articles that designed and created frameworks to make the transition process easier, (50) expand the CE transformation to higher education institutions. (51) introduced a framework that considered circular solutions by mapping national and foreign practices through five perspectives, namely learning, sharing vision,

reflexive governance, regulation, and negotiation in networks. (52) concentrated on organizational behavior and the conditions for reaching CE from an organizational standpoint. (53) conducted a study exploring the prospective “transformative” eco-innovation pathways toward a CE. They emphasized that systemic eco-innovation, bolstered by multidimensional policies, holds the key to unlocking a profound transition. Looking ahead, the development of the CE over the next two decades will extend beyond mere technological and economic problem-solving; it will depend on the capacity to strategically address actual political trade-offs and tackle broader societal challenges. To be effective, actions towards CE must incorporate a greater emphasis on social and behavioral considerations, reflecting the need for a comprehensive and creative approach to overcome barriers and ensure successful implementation (53). (54) introduced a comprehensive framework to transform automotive companies into sustainability leaders, considering the diverse challenges they face, such as regulatory compliance, consumer demands, and environmental impact reduction. The framework encompasses five pivotal steps: “defining a sustainability vision,” “implementing sustainability governance,” “conducting sustainability assessment,” “integrating sustainability into operations,” and “engaging stakeholders.” By adopting this framework, automotive companies can create value for stakeholders and enhance their competitive position. Embracing sustainability leadership not only helps mitigate risks but also boosts their reputation, fosters innovation, and ensures alignment with societal expectations, establishing them as responsible and forward-thinking industry pioneers. One of the most recent research projects by (55) provided a systematic overview to help better understand the transition process to CBMs and the enabling role of I4.0 also what type of technologies can be implemented in CBMs and how they support the CE transition process. According to (55) research, the changes required for the transition towards a CE go beyond traditional business boundaries, encompassing shifts in value chain characteristics and operational models. It highlights the interconnected nature of various factors throughout the product lifecycle, such as service-based models, circular design, reverse flows, consumer involvement, and collaborative efforts. To address the integration of digitally adaptive transformations in new CBMs, the paper presents a conceptual transition framework. This framework goes beyond mere business model innovation and emphasizes the significance of ecosystem innovation in facilitating the systemic nature of the CE transition. In essence, the study emphasizes the need for a holistic approach that considers the interdependencies among different elements to effectively realize the vision of a CE (55,56).

3.2. *Second Cluster (Barriers and Drivers)*

Within this cluster, there are 34 articles dedicated to exploring the impediments, obstacles, prospects, and catalysts associated with the adoption of CE practices. Recognizing the essence of CE, its environmental implications, business implications, and its relevance for our future is undoubtedly vital (57). Yet, it's equally imperative to comprehend the factors that either facilitate or hinder businesses in their pursuit of CE objectives. Also, comprehending not just what CE entails but also what aids or obstructs businesses on their journey towards CE is as crucial as understanding the significance of CE itself. (58) investigated the co-evolution of “lean and green thinking,” as well as the potential for lean and green practices to enable successful transitions to sustainable business practices in Australia. (58) study identifies three pivotal drivers and six significant barriers crucial to the transformation of SMEs. Among these three drivers, “Coercive drivers” appear to be the most influential factor observed among SMEs, potentially attributed to the stringent environmental regulations prevalent in Australia. The SMEs under examination also adopt coercive isomorphic drivers, which involve pressures exerted by influential entities, including other organizations they depend on, and are influenced by ethical and societal expectations. In a broader context, industrial practitioners report experiencing positive reinforcement from their combined lean and green operations, aligning with their aspirations for sustainable business practices. The study distinctly showcases the integration of lean and green strategies rather than their separate implementation. However, the research also uncovers six key obstacles to sustainable business practices, encompassing challenges such as “limited financial resources,” “time constraints,” “knowledge gaps,” “risks associated with adopting new sustainable practices,” “current regulatory policies,” and

the influence of existing organizational culture. We concluded from our research, according to (58) the four key enablers for CE transformation can be named: Aligning the organizational strategic objectives with CE strategies, reinforcing synergistic results by continuous improvement using lean and green methods, involving internal and external stakeholders to optimize the organization's processes, and finally, streamlining processes to ensure transparency and traceability will enable SMEs to achieve sustainable business practices. (59) in their research provided an overview of barriers that restrained the adoption of CBMs, this research indicates that most of the barriers that companies encountered with are at the organizational level. Additionally, (60) investigate the critical success factors for sustainability and CE in the beverage industry which indicates that collaboration, continual innovation, and a solid foundation can be the first steps to adopt CE practices. On the other hand, barriers included external events and lack of support. Based on our research, we have arrived at the conclusion that in addition to the previously mentioned barriers, we can also assert political barriers, lack of consumer awareness (61), lack of financial resources, lack of technical expertise (62), lack of supply chain design and optimization (63), cultural and customer's beliefs (64), lack of strong and committed management (65,66), and regulatory frameworks and policies that either lack the support for CBMs or impede their successful implementation (62), resistance to change, quality of the finished product and associated risks (48) stands out as prominent barriers that organizations encounter when adopting and transitioning to a new CBM. These factors collectively represent a substantial part of the top barriers and challenges that organizations face in their transformation processes (67). To address these challenges, companies and organizations can employ drivers to ease their transformation. According to (68) involvement of different stakeholders plays an important role in CE transformation. Education and cultural change can facilitate the transformation process (69). Of course, having a clear business model and financial plan can help during the transition (62) but an organization should not underestimate the power of collaboration among different consumers, suppliers, and partners which would greatly benefit the CE transformation (70). The result of our research shows that the top management commitment is the key enabler for initiating and designing the best possible organizational structure and organizational culture which can lead to effective CE implementation. Globalization and environmental policy are the other two key enablers that have a direct impact on the long-term strategic planning toward CE implementation (71). The risks linked to adopting CE practices pose a significant obstacle to achieving CE transformation (46). For example, CE necessitates established companies to overhaul both their supply chains and business models to adopt a more sustainable and circular approach. However, the challenges encountered by these established companies in reconfiguring their business models elevate the risk of potential setbacks in the future. Consequently, newly launched firms might possess a greater capacity for disruption and the redesigning of value chains, potentially positioning them as more agile and adaptable players in the evolving landscape of CE practices (61). So, it becomes essential to develop a risk management tool that helps the organizations in navigating these uncertainties, facilitating the transition towards a CBM. This tool serves to enhance managers' comprehension of the specific CE changes feasible within their organizations. Additionally, it provides valuable insights into the various activities, procedural steps, and anticipated outcomes associated with this transformative process. (46). In assessing a company's capacity to implement CE strategies, it is essential to consider not only the external drivers and barriers but also internal factors that can either enable or hinder CE initiatives. According to one of the articles that comprehensively investigated these kinds of drivers and barriers, we can mention that profitability, reduction of costs, resources efficiency, sustainable business and growth, and environmental safety can be addressed as internal drivers for organizations to move toward CE strategies and business models (72). Furthermore, it is crucial for companies to gain a comprehensive understanding of their opportunities and capabilities in terms of "sensing," "seizing," and "reconfiguring" the factors driving CE adoption. These capabilities, often referred to as the dynamic capabilities of the company, can serve as a potent enabler for achieving their sustainability objectives (21,48). For such reasons, according to (21) study, the ability of established companies to adopt CE practices is influenced by their reliance on current product offerings and a business model centered around products and supply chain positioning. These factors can limit

changes in areas such as product categories, target customers, pricing strategies, and brand identity, potentially hindering progress toward environmentally sustainable goals. The study emphasizes the importance of dynamic capabilities for firms to overcome these path-dependent limitations and successfully transition to CBMs. Even though some practitioners pinpoint the importance of dynamic capabilities to facilitate the CE transformation processes in companies (48,49,73), yet there is limited research to fully understand the practical application of dynamic capabilities in transition processes and there is need to investigate this topic in more details (74).

3.3. *Third Cluster (Specific Research)*

The remaining articles in our sample have been categorized into a distinct cluster, encompassing 19 research papers. This cluster is dedicated to the detailed investigation of specific sections of CE practices within particular industries. The primary objective of this cluster is not only to gain insights into which aspects of CE practices can be considered during the transition phase but also to identify potential research gaps that future researchers can explore. This, in turn, can aid organizations in their journey towards a more sustainable economy and CE adoption. These articles were subjected to comprehensive analysis and grouped separately during our research. We conducted a thorough review of each paper, examining their interconnections to better understand the relationship between specific industries and CE strategies.

In transitioning towards a CE, organizations should initiate by gaining a profound understanding of the CE strategies that align with their industry, business model, as well as their company's mission and vision. Establishing accurate targets for CE adoption necessitates a comprehensive comprehension of the essence of CE, ensuring that organizations do not embark on the wrong path. This foundational understanding serves as a critical starting point for a successful transition towards the CE. One of the most significant research projects within our sample, conducted by (8), sheds light on the targets and strategies that can effectively facilitate the transition towards a CE. This study places a particular emphasis on targets due to their pivotal role in governance. Targets are instrumental in guiding transitions from one state to another, making them a crucial focal point in the pursuit of a CE. The study of Morsetto clarifies that the prevailing targets focusing on recovery and recycling, although commonly employed, do not inherently promote the principles of a CE. These targets, while widely used, may lack effectiveness in driving true circularity. Instead, the research suggests that targets should be oriented towards more potent CE strategies. For instance, one such strategy involves the practical application of materials, redirecting solid waste from landfills or incineration without heat recovery.

Another approach focuses on extending the lifespan of products and their components through practices like reuse, repair, refurbishment, remanufacturing, and repurposing. The second set of strategies pertains to design considerations, which encompass principles like longevity, reliability, durability, and ease of disassembly. These design-oriented strategies are conducive to prolonging the life of products and facilitating the transition to a CE. Additionally, there are measures related to smarter product use and manufacturing, encompassing concepts such as refusing wasteful practices, rethinking product development, and reducing resource consumption. These strategies are particularly influential when implemented during the conception, design, and development phases of products (8). (75) highlight the importance of policies that can expedite the transition towards a CE within the European Union. The study strongly advocates that this transition necessitates substantial policy modifications and concerted efforts from both the public and private sectors. It underscores that forthcoming policies should concentrate on nurturing the development of a CE marketplace, fostering innovation in product design and manufacturing, and providing incentives for the adoption of CBMs. These policy initiatives are deemed crucial in advancing the CE agenda in the European Union (75). (76) studied CE transformation processes in the mining industry. Their objective was to fill in the knowledge gaps of business opportunities, drivers, needs, and barriers for tailings valorization since the transformation towards a CE needs advancements in understanding these factors. (77) investigate the "Reverse logistics and the sectoral agreement of packaging industry in Brazil towards a transition to a circular economy." Their findings emphasize the significance of

environmental awareness in facilitating the reverse logistics process. Additionally, their analysis of the closed-loop system for packaging waste indicates that the concept of integrated management plays a pivotal role in implementing an effective reverse logistics system. To ensure the continual enhancement of the recycling sector in Brazil, it is crucial to avoid actions that disrupt the production cycle and create instability. This insight underscores the importance of maintaining a stable and sustainable production process to drive progress in recycling within Brazil. (78) emphasizes the utilization of Blockchain technology for CE transformation. They elaborate on how tokens, facilitated by Blockchain, have the potential to bring together previously disconnected product ecosystems. This convergence has the capacity to unlock new areas of creativity and innovation, which are required for the adoption of CBMs (35). To systematically examine the application of CE and its associated processes, practitioners conducted investigations into CE practices in various countries. For instance, (79) conducted an analysis to understand how companies internally adopt CE principles. This investigation aimed to enhance knowledge regarding the measurement of business engagement with CE practices in Spain. (80) explored the extent to which the German bioeconomy policy is committed to sustainability transformations and whether this commitment is reflected in publicly funded research projects. (81) recently identified and evaluated the risks associated with the implementation of CE practices in the construction sector of developing countries specifically in Pakistan. (60) emphasized the pivotal success factors essential for the transition to sustainability-oriented business models within the food and beverage industry in the Netherlands. (82) study addressed a gap in the literature by conducting an analysis of the influence of external factors on the implementation of CE practices and technology, and how these factors impact sustainable-oriented innovation and sustainable performance among Mexican SMEs. (83) investigated the primary procedures, practices, and measures employed by Greek industries as they transition towards a CE.

The collection of research papers discussed here has played a pivotal role in enhancing organizations' comprehension of CE strategies and practices. These papers have served as valuable resources, offering practical insights into how to navigate the challenges associated with CE adoption. By looking into the role of different enablers, these studies have provided organizations with a roadmap to overcome obstacles and make meaningful progress in their journey toward circularity. However, it's important to acknowledge that the topic of CE and its implementation in various industries represents a relatively nascent field of research.

While these papers have made significant contributions, they also highlight the existence of substantial gaps in our current understanding. These gaps underscore the need for further investigation and empirical research. There are still many uncharted territories in the field of CE, and uncovering these gaps is essential for paving the way toward a cleaner, more sustainable, and truly circular world. As we continue to investigate deeper into these unexplored dimensions, we can anticipate even more profound insights and innovative solutions that will drive us closer to achieving the goals of circularity and sustainability on a global scale.

4. Discussion and Future Research Avenues

Our literature review aimed to comprehensively examine the impact of CE on businesses and assess the current state of CE transformation research. The study's objective was to gain insights into our progress toward sustainability and CE and identify elements conducive to a more efficient and effective transition. We examined barriers and drivers, assessing whether viable solutions were proposed for the identified obstacles. Our analysis revealed that a significant portion of the literature focused on identifying barriers without offering concrete solutions. While some articles explored CE drivers and enablers to address these challenges, there is a noticeable research gap necessitating further investigation for more effective solutions. Additionally, we noted a dearth of CE frameworks and applications of CE principles within the service sector, a critical component of the CE. Recognizing the service sector's pivotal role in enabling CE and sustainability, further research is needed to explore this sector extensively and integrate CE principles for broader sustainability objectives (84). Another challenge associated with CE is the limited awareness and understanding of this critical facet of sustainability among organizations, particularly SMEs (79). Furthermore, our

review underscored the potential of digital technology and I4.0 in expediting the CE transformation. However, there remain gaps in this domain concerning the practical implementation of these technologies within specific sectors and industries. There is a need for additional research to gain a comprehensive understanding of how organizations, particularly SMEs, can effectively harness digital technologies to operationalize CBMs. Only a limited number of innovative and practical frameworks have been introduced by renowned practitioners to assist organizations in their transition towards CE transformation, such as (45) research, their proposed framework illustrates how various CBMs facilitate circular supply chains across different loops: “closing loops,” “slowing loops,” “intensifying loops,” “narrowing loops,” and “dematerializing loops.” These identified CBMs exhibit variations in both the complexity of the circular supply chain and the value proposition they offer. The research findings underscore the pivotal role of CBMs and circular supply chains in advancing sustainability objectives. Also, (22) introduced a two-stage transformation model, comprising a readiness assessment stage and a circular ecosystem-building stage. In the readiness assessment stage, the focus is on evaluating the organization’s existing status, recognizing crucial stakeholders, and cultivating internal competencies. The subsequent circular ecosystem-building stage involves the creation of a CBM, collaboration with pivotal stakeholders, and the actual implementation of circular practices. (46) research presented a tool for managing risk and uncertainty, facilitating the transition to a CBM. This tool empowers managers with a better understanding of the feasible circular transformations they can implement within their organizations, thereby assisting in the reduction of risks associated with the transition towards CE. Within our sample of articles, a novel approach for addressing transformation barriers emerged, namely the concept of dynamic capabilities. The concept of dynamic capability introduced by (85) is one of the important tools of change management in organizations. While literature provides a well-established definition of dynamic capabilities, a significant gap exists in the literature regarding the connection between dynamic capabilities and CE transformation. It is apparent that these capabilities hold the potential to facilitate the adoption and transition process, making it a valuable tool for organizations.

Even though scholars argue that dynamic capabilities play a crucial role in achieving corporate sustainability objectives as well (48,49,73,74,86,87), there still exists some gaps related to dynamic capabilities and CE transformation. Related to SMEs, (88) investigated the effects of “external factors” on the execution of CE strategies and technology, and their impact on fostering innovation geared towards sustainability and sustainable achievements within SMEs. But future investigations might consider examining additional influencers such as investment initiatives to assess their effects on performance. Furthermore, this study cannot conclusively affirm the absence of factors moderating the connections among the researched elements. Additionally, the analysis primarily concentrated on the impact of CE practices on the acceptance of sustainable-oriented innovation. Finally, future research could examine how the transformation to a CE unfolds within the boundaries of each country. Variations in conditions, environments, and available resources significantly influence this transformation process.

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