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RESEARCH ARTICLE

Dynamic Capabilities and Green Strategy in Green Entrepreneurship and Circular Economy: A Study

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ABSTRACT

Despite an increase in research emphasizing the importance of "Green Entrepreneurship" (GE) in creating new business opportunities within the circular economy for "Sustainable Development" (SD), there is still a noticeable lack of studies examining its impact on promoting "Cleaner Production" (CP) and "Circular Economy Practices" (CEP). This study addresses this gap by examining the intricate relationships between "Dynamic Capability" (DC), GE, CP, CEP, and SD. Furthermore, it explores the moderating effect of the "Green Innovation Strategy" (GIS) on the relationship between DC and GE. The bibliometric analysis and "Partial Least Squares Structural Equation Modeling" (PLS-SEM), chosen for their efficacy in identifying relationships, testing the structural model relationship, and assessing GIS moderation effects, reveal that DC significantly contributes to GE, with GIS exerting a notable moderating influence on this association. Additionally, GE positively and substantially impacts CP, CEP, and SD. The study underscores the constructive roles of CP and CEP in fostering SD. This research paper contributes to the existing literature by presenting a comprehensive and up-to-date analysis of published research articles to identify key research trends, prolific authors, leading journals, the most cited works, and the interconnections and evolution of knowledge over time. The study also provides valuable insights for businesses, offering actionable recommendations to accelerate the adoption of sustainable practices in the corporate world and the global pursuit of a greener and more resilient economy, paving the way for a sustainable and inclusive future.

1 | Introduction

In recent decades, rapid population and rising customer demand have driven the expansion of industrial and commercial activities. This growth has significantly impacted both the economic and societal spheres, with the manufacturing sector leading the way. However, this expansion has come at an environmental cost, leading to challenges such as pollution (Mondal et al. 2023; Lotfi et al. 2018; Govindan et al. 2022; Battistella and Pessot 2024). The path to mitigating these issues lies in SD within the manufacturing sector (Bag et al. 2021; Hennemann Hilario da Silva and Sehnem 2022; Mondal et al. 2023). Therefore, shifting consumption patterns and prioritizing CP is essential for contributing positively to the ecosystem (Sharma et al. 2021). Understanding the equilibrium between industrial advancement and SD is critical in this context. According to the "United Nations Development Programme for Sustainable Development Goals" (UNSDGs), SD is defined as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UNDP 2024). Most researchers have emphasized that achieving a balance between industrial growth and environmental, economic, and social development is crucial. Consequently, various contemporary business strategies, such as "sustainable entrepreneurship" (Hummels and Argyrou 2021), GE (Mondal et al. 2023; Lotfi et al. 2018), Industry 4.0 (Khan et al. 2021a),

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and CE (Moktadir et al. 2020), have gained widespread recognition for their beneficial impacts on society and the environment. The execution of these environmentally sustainable practices in MSMEs is challenging. However, they have a crucial role in the economy, significantly contributing to industrial output, employment, and exports.

Green entrepreneurship, a derivative of "green" and "entrepreneurship," refers to the proactive pursuit of environmentally friendly and socially responsible business ventures. As agents of change, entrepreneurs are increasingly recognized for their potential to drive innovation and contribute to SD. GE refers to creating, managing, and growing businesses that prioritize environmental sustainability and social responsibility alongside financial success (Lotfi et al. 2018; Yuan et al. 2024). These ventures often integrate innovative technologies, eco-friendly processes, and resource-efficient practices to minimize their ecological footprint. As the world faces unprecedented ecological crises, GE offers a promising avenue to drive transformative change within the business community (Lotfi et al. 2018; Neumann 2022). Concurrently, the CE paradigm has emerged as a promising alternative to traditional linear economic models. This approach emphasizes minimizing waste generation, resource depletion, and pollution by designing products, services, and systems that enable reuse, repair, remanufacture, refurbishment, recycling, and regeneration (Suárez-Eiroa et al. 2019; Singh et al. 2024). The CE framework aligns with SD objectives and allows businesses to transition towards more "sustainable production and consumption" (SPC) patterns. In addition, dynamic capability (DC) refers to an organization's ability to adapt and innovate in response to changing environments and market conditions. It involves sensing opportunities and threats, seizing opportunities through rapid decision-making and resource allocation, and reconfiguring existing resources and capabilities to meet new challenges (Kump et al. 2019; Ghosh et al. 2022). For the context of GE, DCs play a crucial role in identifying and capitalizing on opportunities related to environmental sustainability. Green entrepreneurs often operate in rapidly evolving markets with changing regulations, consumer preferences, and technological advancements (Jiang et al. 2018). DC enables them to continuously scan the environment for emerging trends and develop innovative solutions to address environmental challenges. For instance, research by Zhang et al. (2020) highlights how DC facilitates the creation of new ventures that focus on SD. These capabilities enable entrepreneurs to identify gaps in the market for eco-friendly products or services and rapidly develop and commercialize innovative solutions. In the CE, DCs are essential for redesigning business models and processes to minimize waste and maximize resource efficiency. GIS plays a pivotal role in enhancing the relationship between DC and GE. GIS involves implementing new or significantly improved products, processes, marketing methods, or organizational practices that significantly reduce environmental risks and ecological scarcities (Le 2022). This strategy enhances environmental performance and creates a competitive edge in the market. According to Lu et al. (2024) and Coppola et al. (2023), DCs enable firms to reconfigure their value chains and adopt closed-loop systems that promote material reuse, recycling, and repurposing. This helps businesses reduce their environmental footprint and create new revenue streams by tapping into the growing demand for "sustainable products and services." In manufacturing MSMEs, DCs are instrumental in driving SD initiatives. These enterprises often face resource constraints and intense competition, making it imperative for them to adapt quickly to changing market dynamics. Research by Ghosh et al. (2022), Kump et al. (2019), and Mondal et al. (2023) emphasizes how DCs enable MSMEs to leverage their agility and flexibility to seize opportunities in sustainable manufacturing practices, such as adopting CP technologies, optimizing energy and water usage, and reducing emissions. Furthermore, DCs facilitate collaboration and knowledge sharing among MSMEs, academia, and government agencies, fostering innovation ecosystems that support the SDGs. For example, studies by Martínez-Peláez et al. (2023) highlight the role of DCs in enabling MSMEs to form strategic alliances with suppliers, customers, and research institutions to co-create sustainable solutions and access new markets. Hence, DCs are critical for driving GE, CE initiatives, and SD in manufacturing MSMEs. DCs empower businesses to create value while addressing environmental challenges and societal needs by enabling organizations to adapt, innovate, and collaborate effectively. Schaper (2002) undertook a comprehensive examination to formulate a distinct framework for precisely delineating the concept of GE. According to previous studies (Haldar 2019; Schaper 2010), green entrepreneurs' commercial ventures' net effect on the natural environment and progression towards sustainability is positive. However, this study does not propose a method for evaluating such ventures' positive and negative impacts on CE, CEP, and sustainability. Driven by the overarching goal of environmental preservation and the attainment of SD, green entrepreneurs adopt business strategies geared towards sustainability. For them, the role of innovation, or DC, in these environmental benefits and ecological sustainability has not been explored. Despite extensive literature on dynamic capabilities and their impact on organizational performance, there is a noticeable gap in understanding how these capabilities influence GE, CP, CEP, and SD in the context of MSMEs in developing countries like India. Furthermore, while the role of GIS as a moderator in the relationship between dynamic capabilities and organizational outcomes has been explored, its specific moderating effect on the relationship between DC and GE within the MSME manufacturing sector remains underexplored. This study seeks to fill these gaps by examining the direct effects of DC on GE, CP, CEP, and SD, as well as the moderating role of GIS in the relationship between DC and GE. This research aims to bridge the gap between theoretical frameworks and practical applications in green innovation strategies, CP, and SD. To address the research questions (RQ), this study sets forth the following RQ:

- **RQ1:** Do "Dynamic Capabilities" (DC) have a direct effect on "Green Entrepreneurship" (GE), "Cleaner Production" (CP), "Circular Economy Practices" (CEP), as well as "Sustainable Development" (SD) in manufacturing MSMEs in India?
- **RQ2:** Is the relationship between DC and GE moderated by the adoption of a "Green Innovation Strategy" (GIS)?

The rest of the paper is structured as follows: Section 2 reviews the relevant literature and theoretical framework, as well as the formulation of related hypotheses. Section 3 outlines the research methods used in the study. Section 4 presents and

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analyzes the empirical findings. Lastly, Section 5 discusses the discussion, conclusions, implications, limitations, and suggestions for future research directions.

2 | Literature Review

The volume of GE, CE, and sustainability research has grown substantially in recent years. Analyzing bibliometric trends reveals an increasing number of publications, indicating the growing importance of these topics in academia. The “literature review” helps to understand the diverse research domains and helps identify key principles, best practices, and challenges associated with closing resource loops. Systematic reviews and bibliometric analyses of the literature are vital for synthesizing current information and providing a thorough picture of a specific research issue (Bougioukas et al. 2021). It aids in identifying and evaluating all relevant studies, resulting in a thorough analysis of the available data. This methodical technique reduces bias and increases the dependability of findings from the body of literature. Systematic reviews contribute to evidence-based decision-making in various sectors, including medicine, psychology, and entrepreneurship.

2.1 | Bibliometric Analysis

A bibliometric analysis is used to evaluate past research, such as publishing productivity and the most significant papers on integrating GE, CE, and SD within the business. The study also seeks to untangle the conceptual structure of this integration by studying the frequent topics, themes, and application areas in the literature. This study employs a comprehensive strategy that combines bibliometric and content analytic tools to thoroughly explore the large research landscape related to GE and CE.

To identify the relevant research paper for the bibliometric analysis, the database and keywords that are relevant to the research objectives are chosen. The goal was to amalgamate the concepts of “green entrepreneurship” and “circular economy,” as they are two critical sustainability factors (GE and CE). The search string incorporated terms related to TITLE-ABS-KEY, including combinations such as (“Green Entrepre*” AND “Sustainab*”) OR (“Green Entepren*” AND “Circular Economy”) OR (“Circular Economy” AND “Sustainab*”) OR (“Green Entrepre*” AND “Circular Economy” AND “Sustainab*”). This search yielded 13,387 articles. The search was restricted to articles published in English journals between 2007 and 2023. The time period from 2007 to 2023 was chosen for collecting data since there was no relevant research before 2007; if there had been, they would not have addressed this issue directly. However, after UNDP 2015, governments, policymakers, businesses, and entrepreneurs have shifted their attention to sustainability. As a result, after 2015, this became an emergent study area. Furthermore, the data were collected from Scopus, a well-regarded scientific database containing many research articles (Paul et al. 2021; Donthu et al. 2021). Scopus was selected for its capacity to index publications meeting stringent scholarly criteria and for its comprehensive provision of bibliometric data. Widely endorsed for large-scale corpus curation (Paul et al. 2021) and often recommended for “bibliometric” analyses (Donthu et al. 2021), Scopus is recognized as a reputable source of bibliometric data (Kumar et al. 2021), with a notably strong correlation to alternative databases such as Web of Science database, EBSCO, and JSTOR (Kumar et al. 2021). Despite Web of Science's narrower coverage (Paul et al. 2021), Scopus remains the preferred choice owing to its combination of comprehensiveness and quality for scholarly review purposes. This preference for SCOPUS over other databases is justified by its comprehensive coverage and robust indexing, rendering it an invaluable resource for scholarly review. In this study, a two-step search approach is used to select relevant articles for their study. In the first step, they coded the articles based on their relevance to GE, CE, and SD. Following this initial coding, the authors collaboratively reviewed and discussed the articles, excluding 906 articles that solely focused on the individual applications of GE and CE, which did not align with the present study's scope. In the second step, after removing 1662 articles, the researchers retained 2568 articles directly relevant to their study objectives. To ensure consistency in the selection process, the researchers conducted a coding agreement between two co-authors and consulted with external experts to resolve any disagreements. The “inclusion” and “exclusion criteria” used for selecting the relevant articles are presented in Figure 1.

This study examines the productivity of research publications focusing on integrating GE and CE for SD in the business sector. Additionally, the study analyzes the overall publication trends in this field over the years. The bibliometric data encompass various aspects of publications, including title, abstract, publication year, keywords, and citation (Donthu et al. 2021).

The annual publication count is a reliable indicator of the research trajectory within a particular field. An examination of the trend of publication numbers can offer insights into the likely direction of research in the coming future. A graph illustrating the annual change in the number of publications and the total number of publications was created to examine the research trend regarding implementing environmentally friendly techniques in the domains of CE and SD. The plot analysis indicates that the investigation of implementing environmentally friendly businesses in the context of CE and SD is a growing area of research that has become increasingly popular in recent times. Since 2015, this subject of study has grown exponentially. In addition, the graph depicting the total number of publications indicates that researchers worldwide have increasingly focused on entrepreneurship and corporate entrepreneurship since 2007. The exponential increase in articles published since 2007 highlights the importance of GE and green business practices in CE and sustainability (see Figure 2).

Table 1 demonstrates that economically advanced and developing nations have recognized the importance of promoting the growth of environmentally friendly businesses, a circular economy, and sustainable practices. The “United Kingdom” has garnered the highest number of citations among the 255 papers published within its borders. The “Total Link Strength” (TLS) is a measure that estimates the level of collaborative research between two countries (Table 1). The TLS indicated that the United Kingdom exhibited the highest level of support for collaboration in research, with a TLS score of 276.

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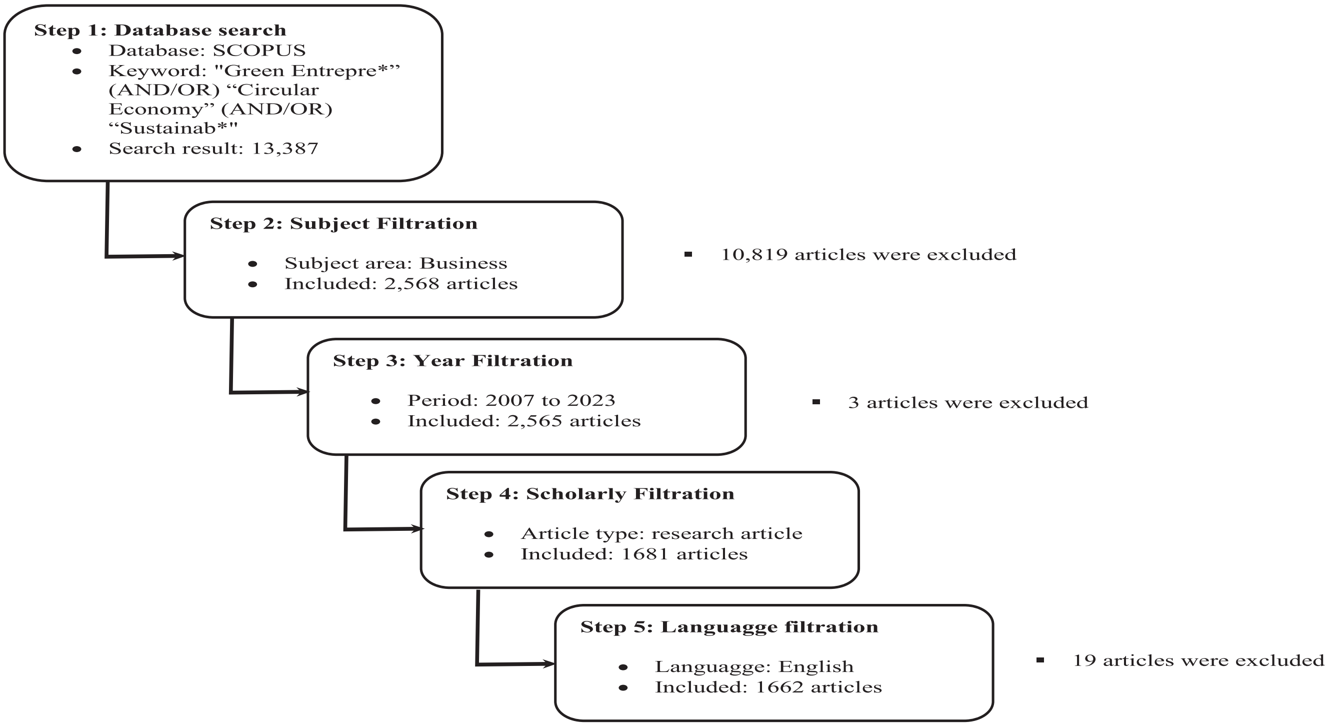

FIGURE 1 | Search filtration strategy.

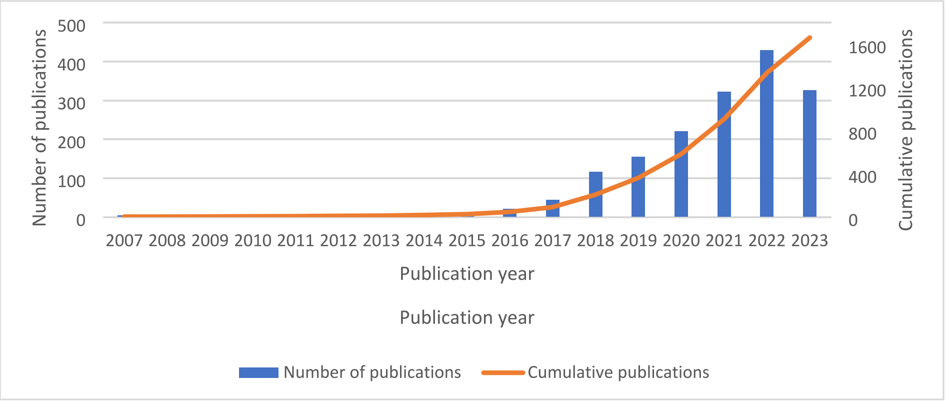

FIGURE 2 | The number of publications on a year-on-year basis (own compilations).

TABLE 1 | The top countries that published more than 20 documents.

Country	No. of publications	Percentage (%)	Nominal GDP rank	Citation	Average citation per document	Total link strength (TLS)
United Kingdom	255	10.95	5	13,661	53.57	276
Italy	239	10.26	8	9690	40.54	156
China	192	8.24	2	11,059	57.60	201
India	187	8.03	6	4409	23.58	157
Spain	120	5.15	15	3937	32.81	87

Note: "Nominal GDP" rank as per the "International Monetary Fund" (2019 estimates), "World Economic Database," 2022.

Figure 3 reveals that the United Kingdom collaborated with France, Brazil, China, India, Australia, the United States, Sweden, Italy, and Spain in publishing papers. France has published research documents with India, China, the United States, Brazil, the United Kingdom, and Turkey with TLS 171. In addition, China has a TLS score of 201 and has published documents with the United Kingdom, Denmark, Taiwan, Malaysia, Australia, India, Pakistan, the United States, and Brazil.

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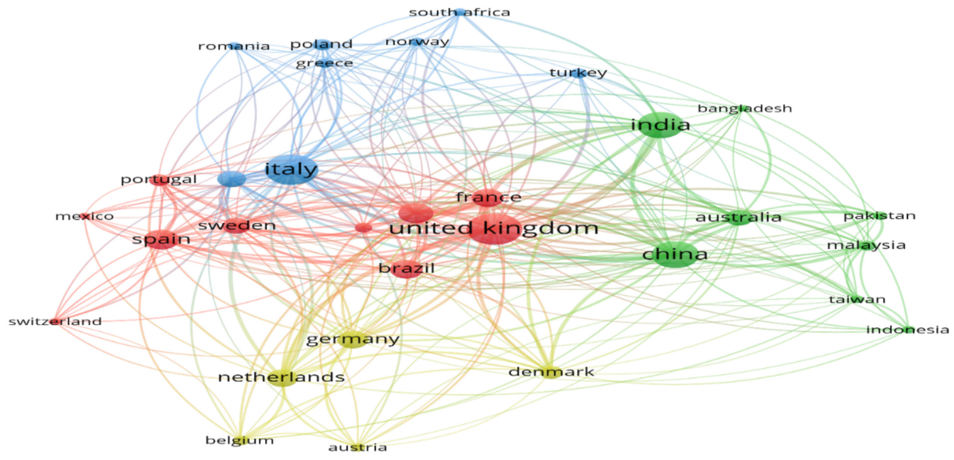

FIGURE 3 | Country cooperation network on GE and CE as well as SD research (N.B.: Countries that published a minimum of 20 documents were included).

TABLE 2 | Co-authorship and organization.

Sl. no.	Organization	Country	Documents	Citations	Average citations per document	TLS
1	Centre For Supply Chain Improvement, The University of Derby, Derby	United Kingdom	11	138	12.55	5
2	Guildhall School of Business and Law, London Metropolitan University	United Kingdom	9	263	29.22	2
3	Management Development Institute	India	8	41	5.13	0
4	Yonsei Frontier Lab, Yonsei University	South Korea	8	152	19	10
5	Copernicus Institute of Sustainable Development, Utrecht University	Netherlands	7	64	9.14	2

Note: N.B.: minimum number of documents 5, and total link strength (TLS).

Further, the study identified the leading organizations that have published over three documents on the specific research topic (Table 2). The bibliometric research revealed that there were a total of 20 organizations that consistently published more than five documents throughout the years. The "Centre for Supply Chain Improvement at the University of Derby," located in Derby, United Kingdom, has produced 11 documents that have received 138 citations.

The relationship between sources and criteria offers insight into the preferred journals where authors choose to publish their findings. Figure 4 provides a comprehensive list of the prominent publications that have published research articles on CE and GE.

The research uses a method that looks at how often keywords appear together from author-provided keywords that are used in all the articles that make up the review corpus. This approach aims to identify the primary subjects and motifs related to the integration of GE and CE within the business context (Figure 5). The term "circular economy" appears most often in the list, with a total of 1214 instances. It is followed by "sustainable development" with 707 occurrences, "sustainability" with 441 occurrences, "life cycle" with 160 occurrences, "waste management" with 153 occurrences, and "recycling" with 139 occurrences.

2.2 | Theoretical Framework

To construct hypothetical relations, a solid theoretical framework has to be established. Previous studies have identified enablers or barriers for GE initiatives despite often lacking a solid theoretical background. Furthermore, the concepts of GE and CE are relatively new and evolving fields. There remains a notable gap in research that explains how stakeholders, regulators, and organizations influence GE factors within business contexts and contribute to the advancement of CE and SD. The theoretical foundation for this study is grounded in the "Dynamic Resource-Based View" (DRBV) theory, which provides a comprehensive framework for understanding these complex interactions.

2.2.1 | DRBV

The Barney resource-based view (RBV) posits that an organization's competitive edge and economic advantages stem from the accumulation of resources that are valuable, rare, inimitable, and nonsubstitutable (VRIN) (Barney 1986). The DRBV extends the traditional RBV by integrating the concept of dynamic capabilities. The DRBV builds on this by emphasizing the

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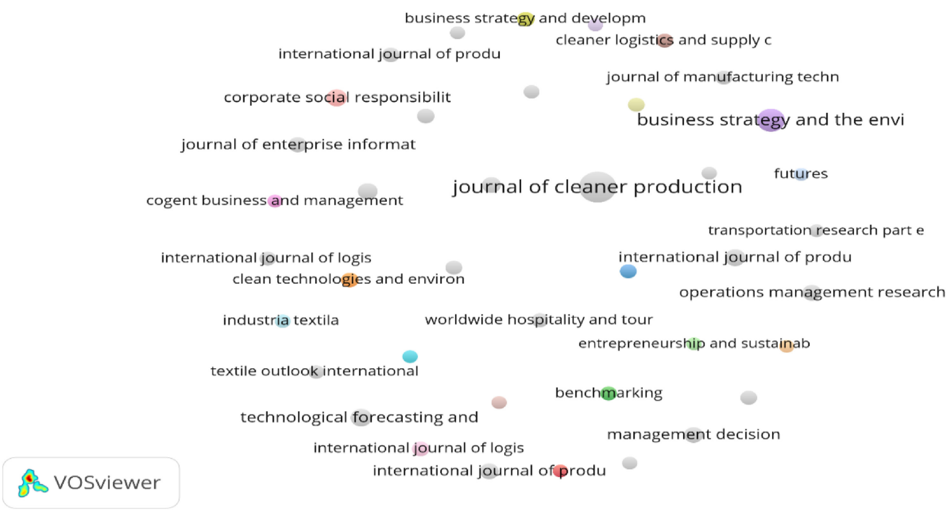

FIGURE 4 | Journal distribution networks (N.B.: more than five publications of each journal considered).

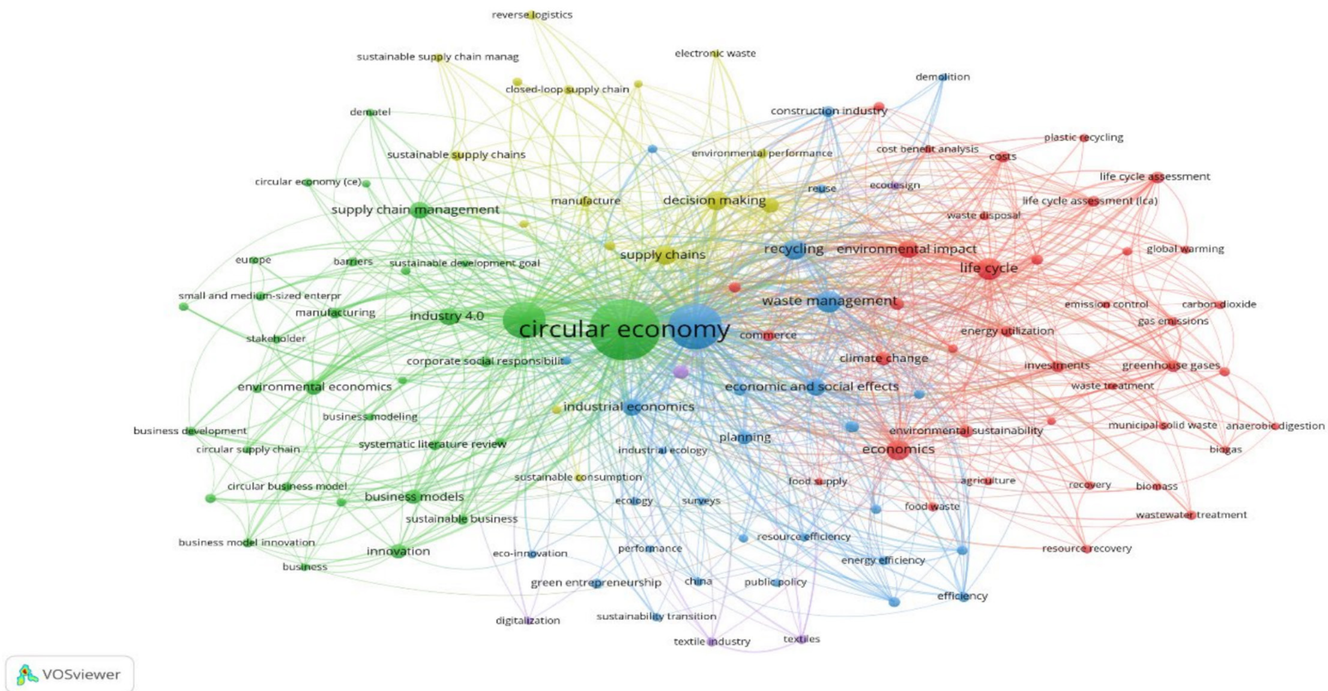

FIGURE 5 | Keyword and co-occurrence relationship of the researcher who is working on GE, CE, and sustainability (N.B.: For the repetition of keywords, at least five documents were considered).

importance of possessing valuable resources and the ability to reconfigure and renew these resources in response to changing environments (Lin and Wu 2014). The DRBV theory posits that a firm's competitive advantage stems from its ability to adapt, integrate, and reconfigure internal and external resources to address rapidly changing market conditions. This DC allows firms to remain competitive and innovative over time, particularly in complex and volatile environments. The DRBV framework highlights the importance of sensing, seizing, and transforming opportunities for GE and sustainability, particularly in response to new environmental regulations and changing consumer preferences. The DRBV theory provides a comprehensive framework for understanding how firms can leverage their internal resources and dynamic capabilities to drive GE, adopt CEP, implement CP, and develop GIS, contributing to SD. This dynamic approach is essential for achieving SD, particularly in today's business world's rapidly changing and complex environment. By integrating these concepts, DRBV helps explain how firms can continuously adapt and thrive while contributing to environmental and social sustainability.

2.3 | Hypothesis Development

2.3.1 | Relation Between DC, GE, and GIS

DC are widely recognized for their role in enabling organizations to maintain superior performance over time, characterized by their ability to "integrate," "build," and "reconfigure" internal and external competencies to adapt to rapidly changing

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environments (Monteiro et al. 2019). These capabilities consist of three primary elements: (1) recognizing opportunities and threats (sensing); (2) seizing identified opportunities; and (3) enhancing, safeguarding, or adapting both tangible and intangible resources to maintain competitiveness (Schöggl et al. 2023; Ghosh et al. 2022; Kump et al. 2019). In addition, DRBV posits that a firm's unique resources and capabilities, particularly its ability to adapt and reconfigure these resources in response to environmental changes, are crucial for competitive advantage. While earlier research has underscored the significance of the "speed of change" in business landscapes, contemporary viewpoints emphasize the heightened level of uncertainty as a more crucial external factor (Monteiro et al. 2019; Schöggl et al. 2023; Wilden et al. 2013). As firms dealing with sustainability challenges frequently experience significant uncertainty, this reframing improves DC's relevance in understanding corporate sustainability and involvement in the CE (Makhloufi 2023). Research has consistently underscored the pivotal role of DC in "corporate sustainability management" (Schöggl et al. 2023; Tran 2023), CEP (Lu et al. 2024; Scarpellini et al. 2020), and related domains. Hypotheses have been formulated, suggesting a positive influence of DC on the execution of CEP (Santa-Maria et al. 2022). Firms with robust DC exhibit superior decision-making not only in product-related matters but also in selecting alliances (Teece 2020; Tran 2023).

Simultaneously, there is a notable shift in consumer purchasing behavior towards environmentally sustainable products, commonly referred to as green products. This trend holds the potential to foster the emergence of GE (Lotfi et al. 2018). As the green market experiences growth and development, global opportunities arise for entrepreneurs. Environmental consciousness and shifting government policies have increased the demand for green products, catalyzing green innovations and introducing new, eco-friendly products. Entrepreneurs consistently focus on innovative ideas and incorporating green innovation strategies within the dynamic business landscape (Alnaim et al. 2022). Entrepreneurs anticipate that embracing a green innovation strategy will enable their businesses to effectively meet market demands (Lotfi et al. 2018). Consequently, companies integrating the term "green" into their DC are making judicious and contemporary decisions, with favorable outcomes anticipated both in the present and the future. Beyond this point, the development of DC is deemed essential for the effectiveness of collaboration focused on GE (Meirun et al. 2020; Tran 2023). In such collaborations, companies obtain the necessary knowledge and resources to shift towards more sustainable and circular approaches to value creation. Strong DCs are essential for innovation-oriented collaboration, particularly in the formation of networks, emphasizing their importance in green innovation strategy activity within the manufacturing sector (Dey et al. 2023; Jiang et al. 2018). Depending on the DCT's theoretical principles, it is proposed that organizations with strong dynamic capabilities are better positioned to thrive in adopting and implementing innovative, sustainable, or eco-friendly practices. Additionally, the adoption of GIS is seen as offering companies the potential for increased efficiency, more accurate analytics, and transparent supply chains (Bag et al. 2022). Research suggests that organizations embracing environmentally friendly innovation strategies enhance their ability to adapt and exploit opportunities, fostering GE by aligning internal capabilities with external environmental demands (Jiang et al. 2018; Ma et al. 2022; Makhloufi 2023; Pan et al. 2024). Green innovation helps shape DC in sustainable business practices and influences the association between organizational adaptability and GE's success. The relationship between DC and the implementation of green technologies has been explored through various studies, including the analysis of "Big Data Analytics" (BDA) capabilities, differentiation strategy, absorptive capability, and their impact on GE capabilities. In addition, to delve deeper into this relationship, the study introduces the concept of a GIS as a potential moderator. The positive effects of DC on implementing green technologies have also been hypothesized, emphasizing their role in responding to uncertainties, and fostering the adoption of the "green supply chain" (Mathivathanan et al. 2017). The DC's view plays a crucial role in explaining organizations sustained superior performance, particularly in the context of sustainability, CEP, GE, and the implementation of digital technologies. In the contemporary and evolving business landscape, DC plays a pivotal role in substituting conventional products with environmentally friendly alternatives, thus facilitating a strategic entry into the burgeoning green market through a deliberate and sustained progression. Establishing the green market presents entrepreneurs with a distinct opportunity for engagement. Moreover, the implementation of a GIS catalyzes the development of DC, encompassing green product development, eco-conscious design, sustainable supply chain practices, and environmentally responsible production methods (Lotfi et al. 2018). This collective approach ultimately contributes to the advancement of GE. Therefore, we hypothesize the following direct and positive relationship:

H1. *DC positively influences GE.*

H7. *GIS significantly moderates the relationship between DC and GE.*

2.3.2 | The Relationship Between GE and SD

Rapid industrialization has brought about both positive impacts, such as economic development, and negative consequences, such as environmental pollution and global warming (Mondal et al. 2023). Consequently, consumer preferences have shifted towards eco-friendly products and services due to government pressure, heightened consumer awareness, and the increasing demand for ecological goods (Sumaira and Siddique 2023). Lotfi et al. (2018) establish a conceptual model delineating the interconnections among "green product design," "green supply chain," "green design," "green entrepreneurship," and SD. The study's findings underscore the significant role of GE in fostering SD.

The setting up of environmental enterprises and the rise of the green market provide prospects for contributing to SD. Consequently, the concept of green business has gained substantial attention, leading to the development of frameworks for SD within the entrepreneurial context (Ameer and Khan 2022). Understanding GE necessitates an exploration of the economic factors driving environmental sustainability. Entrepreneurs can play a crucial role in addressing the challenges posed by natural

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resource depletion and environmental concerns, contributing to the creation of a sustainable future through innovations in production, operations, and new product development (Mondal et al. 2023; Karimi and Nabavi Chashmi 2019; Li et al. 2024). The study by Yasir et al. (2023) indicates that GE significantly influences economic growth, global market presence, competitiveness, sustainable job creation, and the resolution of societal issues. Therefore, GE emerges as a pivotal force for economic and SD within any society (Ameer and Khan 2022; Soomro et al. 2023). Recognizing entrepreneurship as a driving force for economic development, it becomes evident that the rise of the green market offers opportunities for GE, ultimately contributing to achieving SD. Consequently, the following hypotheses are formulated:

H3. *GE positively influences SD.*

2.3.3 | The Relationship Between GE and CEP

GE plays a pivotal role in advancing the principles of the CE, an economic model that prioritizes sustainability by minimizing waste, reusing resources, and recycling materials to establish a closed-loop system. According to Mondal et al. (2023), green entrepreneurs drive the transition towards a more sustainable and circular economy. Studies by authors such as Appiah et al. (2023) and Ul-Durar et al. (2023) highlight the active engagement of green entrepreneurs in eco-innovations, designing products with extended lifecycles that promote reuse and recycling. GE contributes to waste reduction by creating products and services that extend the life cycle of materials through innovative approaches like recycling, upcycling, or repurposing, as demonstrated in studies by Trapp and Kanbach (2021) and Veleva (2021). Moreover, it emphasizes efficient resource use in product and service design, minimizing waste and environmental impact (Mondal et al. 2023). Research by Jawahir and Bradley (2016), MahmoumGonbadi et al. (2021), and Tapia et al. (2021) underscores how green entrepreneurs foster the circular economy by establishing closed-loop systems where products are designed for disassembly and materials are recycled. Ghisellini et al. (2016) emphasize the necessity for policy support and collaborative efforts to scale up circular economy initiatives, with green entrepreneurs acting as catalysts for change. Innovative business models, such as product-as-a-service and "closed-loop systems," are identified as crucial by Geissdoerfer et al. (2017, 2022) and Jensen et al. (2019) for achieving circular economy goals. Additionally, as highlighted by Jayasinghe et al. (2021) and Potluri and Phani (2020), green entrepreneurs play a significant role in proper waste management, further contributing to circular economy development. Moreover, GE actively contributes to using and generating renewable energy, aligning with the circular economy's objective of decoupling economic growth from resource consumption. By promoting and utilizing clean energy sources, green entrepreneurs reduce greenhouse gas emissions and foster SD and responsible resource management within the business ecosystem (Demirel et al. 2019; Haldar 2019). Hence, GE catalyzes CEP, advancing SD and responsible resource management. Based on the above discussion, we can formulate the relationship as follows:

H2. *GE positively influences CEP.*

2.3.4 | Relationship Between GE and CP

GE involves the establishment and management of enterprises dedicated to environmental sustainability and social responsibility, encompassing activities such as the creation of eco-friendly products, the integration of renewable energy sources, and the adoption of environmentally responsible business practices (Gast et al. 2017; Pacheco et al. 2010). Simultaneously, CP aims to minimize the environmental impact of production processes and products by optimizing resource utilization, reducing waste, and enhancing production efficiency (De Oliveira Neto et al. 2016; Hens et al. 2018). The interconnection between GE and CP is paramount for fostering SD and environmental conservation. Meirun et al. (2020) underscore the role of GE in advancing CP practices, highlighting their complementary nature in addressing environmental challenges. Green entrepreneurs are often pioneers in adopting innovative, eco-friendly technologies, including cleaner production methods, sustainable materials, and waste reduction technologies. Research by Mondal et al. (2023) emphasizes the connection between GE and CE, emphasizing the crucial role that green entrepreneurs play in adopting and promoting CP practices within their businesses. Neumann (2022) and Trapp and Kanbach (2021) further stress the significance of sustainable business models in GE, with entrepreneurs embracing circular economy principles advocating for CP by eliminating waste and pollution and encouraging the reuse and recycling of materials. The research by Gast et al. (2017), Meirun et al. (2020), Neumann (2022), Schöggl et al. (2023), and Trapp and Kanbach (2021) also looks into how GE helps small- and medium-sized businesses make production cleaner. It finds critical drivers like eco-innovation, environmental management systems, and stakeholder engagement. This relationship is integral, as GE drives innovation and catalyzes change towards more sustainable business practices, contributing to a harmonious balance between economic pursuits and environmental preservation. Therefore, it can be proposed that GE contributes to CP for sustainability. Based on the discussion, the following hypotheses are posited:

H4. *GE positively influences CP.*

2.3.5 | Relationship of CP and CEP With SD

Circular economy stands as a pivotal component in the pursuit of SD, harmonizing with the triad of sustainability pillars encompassing economic, environmental, and social dimensions (Mondal et al. 2023). Scholarly literature (e.g., Corona et al. 2019; Suárez-Eiroa et al. 2019) consistently underscores the substantial and beneficial contributions to CP and SD. From an economic standpoint, adopting CP practices within the MSME manufacturing sector yields heightened efficiency, diminished production costs, and heightened competitiveness within the global market (Mondal et al. 2023; Mukherjee et al. 2023). Environmentally, a circular economy and CP minimize resource utilization, waste generation, and emissions, thereby curbing the ecological impact of manufacturing operations (Sousa-Zomer et al. 2018). Aligned with waste management principles, it advocates for "reducing," "reusing," and "recycling" materials, fostering a circular economy model. This mitigates environmental repercussions and ensures the sustained availability of resources. In the realm of

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social development, CP cultivates a safer and healthier working environment, reducing occupational hazards and elevating the well-being of workers (Hens et al. 2018; Govindan et al. 2022). Moreover, it advances corporate social responsibility by addressing community concerns and nurturing stakeholder engagement (Bohdanowicz et al. 2011). CP assumes a critical role in aiding nations to attain SDGs, particularly those pertaining to "responsible consumption and production" (SDG 12) and "climate action" (SDG 13). Through waste management strategies and eco-friendly initiatives, CP actively contributes to the overarching objective of forging a sustainable and resilient future (Dantas et al. 2021; Ogunmakinde et al. 2022).

Despite the ongoing debate regarding the impact of "corporate sustainability" practices on a firm's economic performance, recent studies focusing specifically on CEP consistently indicate, at minimum, a positive correlation (D'Angelo et al. 2023; Silvestri et al. 2021). For instance, (Vranjanac et al. 2023) reveal that organizational culture moderates the relationship between the implementation of CEP and enhanced financial efficiency, operationalized through strategies such as "reducing," "reusing," "recycling," "recovery," or "restoration." According to Khan et al. (2021a, 2021b), there is a positive correlation between a company's environmental and financial performance and the adoption of CEP as measured by circular design, "production," "consumption," "collection," "recycling," and "reuse." This encompasses constructs pertinent to financial outcomes, competitive positioning, and corporate standing. Within the context of their investigation involving enterprises (Bag et al. 2021; Hennemann Hilario da Silva and Sehnem 2022; Govindan et al. 2022), it is discerned that the implementation of CEP, operationalized via R-strategies, plays a contributory role in enhancing firm performance. These practices act as important factors in the relationship between business analytic capabilities and the pursuit of SD. Furthermore, the study conducted by Schöggl et al. (2023) found that environmental innovation, which is closely linked to CEP, has a more significant impact on financial performance compared to environmental orientation. Nevertheless, it is essential to note that a circular economy does not encompass all aspects of sustainability. Instead, it serves as only one of the numerous methods that work together to achieve SD (Geissdoerfer et al. 2017; Schöggl et al. 2023). Moreover, it should be noted that CEP may not always effectively mitigate the adverse environmental and social consequences associated with production and consumption systems (Zink and Geyer 2017). Additionally, it is important to acknowledge that CEP might result in rebound effects. Although it cannot be automatically expected that implementing circular economy techniques would result in higher sustainability performance, the limited number of existing empirical studies does suggest a favorable impact. Bag et al. (2021) and Hennemann Hilario da Silva and Sehnem (2022) discovered that implementing circular economy methods, as defined by the 10Rs, has a beneficial impact on SD. This impact was assessed by examining three aspects: "environmental quality," "economic prosperity," and "social equality." Mora-Contreras et al. (2023) and Triguero et al. (2023) have found that implementing circular economy activities, such as circular procurement, recycling, remanufacturing, and circular design, has a favorable impact on the environmental performance of businesses. Based on these data, we propose the hypothesis that adopting CEP has a beneficial impact on the financial performance of a business. Hence, the CE or CEP arises as a fundamental element in the quest for SD, exerting a beneficial influence on economic, environmental, and social aspects. The incorporation of this technology into MSMEs not only improves their competitive advantage but also fits with global efforts to achieve the SDGs. Therefore, drawing from limited information on cleaner manufacturing and deductive research relevant to the circular economy, we propose that adopting CEP will benefit an organization's SP. Hence, we can formulate the abovementioned relationship as follows:

H5. *CEP positively influences SD.*

H6. *CP positively influences SD.*

Figure 6 provides a summary of the relationships and proposed hypotheses of the factors.

3 | Methodology

This study employed a two-phase methodology (Figure 7) to identify, examine relationships, and assess factors within the context of GE that facilitate business engagement in CE and SD. In the first phase of this study, an extensive review of existing literature was conducted, drawing from a variety of scholarly databases to gather relevant research content. The initial phase involves an extensive literature review from

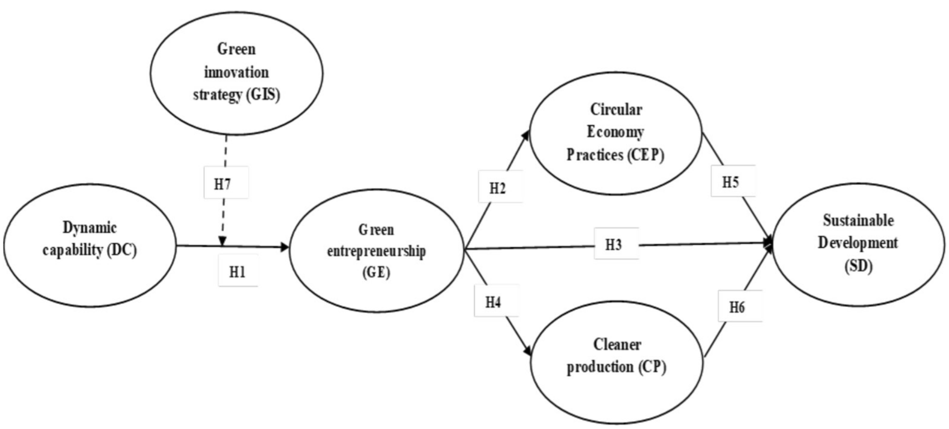

FIGURE 6 | Hypothesized model (author's compilation).

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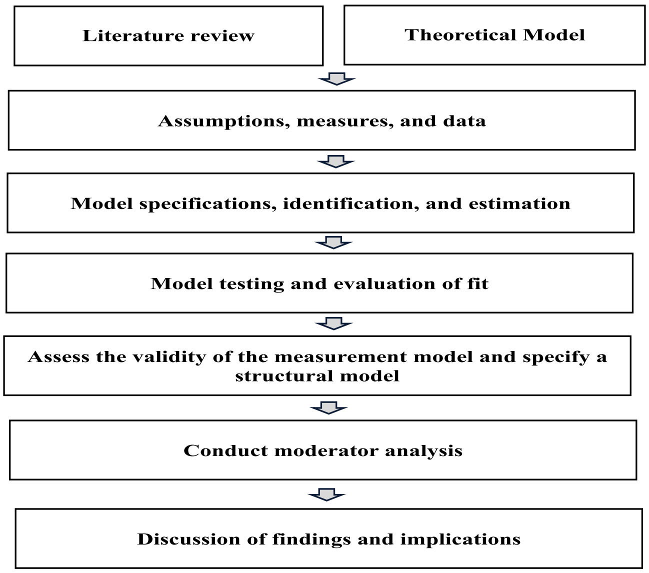

FIGURE 7 | Steps follow in this study (Authors' compilation).

scholarly databases to gather relevant material on GE, CE, and SD, establish a theoretical foundation, and identify key factors and concepts. Then, based on the prior literature, the hypothesis was developed, and based on this theoretical framework, it was developed and tested using empirical data from different types of manufacturing organizations, assessing their green and sustainability practices based on framework criteria. In the final phase, we also examined the moderating influence of the GIS on the relationship between the DC and GE. The comprehensive research methodology employed in this study for analysis is elaborated in Figure 7.

3.1 | Partial Least Squares Structural Equation Modeling (PLS-SEM) Analysis

In this study, PLS-SEM has been used to study the relationships between the latent "independent variable" and the "dependent variable." Here, PLS-SEM is advantageous over other SEM techniques due to its ability to handle small sample sizes and complex models effectively through nonparametric estimation and "Ordinary Least Squares" (OLS) regression-based methods (Hair et al. 2021; Mateos-Aparicio 2011; Galindo-Martín et al. 2019). It excels in exploratory research by accommodating any data distribution, maximizing predictive power, and explaining variance for latent dependent variables. Unlike "Covariance-Based SEM" (CB-SEM), PLS-SEM offers enhanced computational efficiency and reliability for studies with mixed measurement scales and cause-and-effect relationships (Hair et al. 2021). Its flexibility and robustness make it suitable for theory-based conceptual model development and hypothesis testing, particularly in sustainability literature and studies involving the top management of manufacturing MSMEs (Hair et al. 2021; Mateos-Aparicio 2011; Byrne 2013).

3.2 | Sample and Sampling Approach (es)/Technique (s)

For data collection, the Indian MSME manufacturing sector was chosen because it has a substantial contribution to the global economy (Khurana et al. 2021; Mondal et al. 2023). Additionally, these sectors are notably responsible for high CO_2 emissions, posing significant environmental challenges (Manigandan et al. 2022). Hence, targeting Indian manufacturing MSMEs is deemed suitable for achieving the research objectives. Data for this study were obtained through a structured questionnaire derived from previously validated scales. Prior to administering the final survey, the content and clarity of the questionnaire were meticulously reviewed and refined. The questionnaire was distributed to 317 MSMEs across India via an online platform survey, utilizing "systematic convenience sampling methods." Given the exploratory nature of this research, respondents were selected based on their knowledge and expertise in green practices, focusing on those engaged in or planning to implement sustainability-related activities. Similar studies, such as Asiaei et al. (2022), have utilized small sample sizes in exploratory research. Ultimately, 191 respondents completed survey questionnaires, yielding a response rate of 36.94%. Of these, 14 responses were deemed unusable due to incomplete or missing data, resulting in 177 valid responses for further analysis, exceeding the minimum required sample size of 50 (Hair et al. 2021; Mateos-Aparicio 2011; Hair et al. 2011). The sample predominantly comprised micro- and small enterprises, accounting for approximately 62.71%. Female respondents made up around 27.12% of the sample. The majority of respondents had experience spanning 2–5 years (9.60%), 5–10 years (32.20%), and more than 15 years (25.99%). Regarding educational qualifications, 62.71% of respondents were graduates, and 25.99% held qualifications above graduation. Regarding investment in assets (machinery and plant), 19.21% had investments of less than 1 crore, 33.90% had less than 10 crores, and 46.89% had investments of less than or equal to 50 crores. Table 3 provides the descriptive statistics of the sample.

3.3 | Data Collection Method

In order to create the survey for this study, we considered established, validated measuring instruments. There are two parts to the questionnaire: one comprises screening and demographic questions, and the other has items that measure the constructs employed in this research. A 7-point "Likert scale," with 1 representing "strongly disagree" and 7 representing "strongly agree," was used to assess all elements for each construct. For measuring CEP, we adopted a scale from Sharma et al. (2023). This measure encompasses five items, including statements such as "Our MSME redesign packaging," "Our MSME works on renewable energy and resources," and other items. A seven-item scale from Le et al. (2022) and Lotfi et al. (2018) was utilized to measure SD. These seven items evaluate aspects such as "Our MSME achieved profitable growth over time" and other related items. For the measurement of GIS, we use a seven-item scale adopted from Alnaim et al. (2022), which contains items like "Our MSME adjusts its business practices or operations to reduce damage to the ecological environment" and several other items. In addition, to measure GE, we adopt a five-item scale (Lotfi et al. 2018), which contains items like "green entrepreneurship eliminates environmental degradation" and many other items. A five-item scale from the work of Samadhiya et al. (2023) was used to measure CE. This scale comprises items like "In our MSME, products are designed to be readily repaired or replaced," along with the other four items. For DC, we adopted a

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TABLE 3 | Profile and characteristics of respondents.

Attributes	Characteristics	Frequency	%
Gender	Female	48	27.12
	Male	129	72.88
Role in this organization	General manager	29	16.38
	Logistics and supply chain manager	49	27.68
	Marketing/ sales manager	51	28.81
	Technical managers	42	23.73
	Others	6	3.39
Years of experience (years)	Less than 2 years	8	4.52
	2–5 years	17	9.60
	5–10 years	57	32.20
	10–15 years	49	27.68
	15–20 years	40	22.60
	More than 20 years	6	3.39
Highest education	Below graduation	20	11.30
	Graduation	111	62.71
	Above graduation	46	25.99
Type of industry	Clothing and textiles	5	2.82
	Automotive industry	54	30.51
	Electrical, electronics, and computers	5	2.82
	Food production	17	9.60
	Metal manufacturing	42	23.73
	Industrial equipment's	17	9.60
	Wood, leather, and paper	16	9.04
	Petroleum, chemicals, and plastics	13	7.34
	Pharmaceutical products	8	4.52
Annual turnover	≤ 5 crores	35	19.77
	≤ 50 crores	76	42.94
	≤ 250 crores	66	37.29
Investment in plant and machinery or equipment	Not more than Rs. 1 crore	34	19.21
	Not more than Rs. 10 crores	60	33.90
	Not more than Rs. 50 crores	83	46.89

scale from Schöggl et al. (2023), which includes 14 items, such as "Our MSME knows the best practices in the market," among others. To measure CP, we adopt a "four-item scale" from the work of Afum et al. (2022). These four-item scales evaluate factors such as "Our MSME uses clean and more energy-efficient technologies in capacity decisions" and other pertinent aspects. A detailed discussion of each instrument and the related construct has been provided in Table A1 (Appendix A).

3.4 | Data Analysis Method

In this phase of data analysis, a three-step methodology or approach was used (Sobel 1982). To ensure the robustness of our measurement instruments, we begin with a series of tests. Initially, we conducted a "common method variance" (CMV) assessment alongside "reliability" and "validity." Subsequently, we examine the structural relationships within our model through further analyses in SmartPLS 3. In the final phase, we conduct a moderation analysis using the SPSS PROCESS macro (Hayes 2012) to test our hypotheses. This rigorous three-step methodology ensures comprehensive evaluation and validation of our proposed model.

3.5 | Validity and Reliability

To assess the robustness of our scale, we employed various tools and techniques. Additionally, considering that all constructs in this study are self-reported, there is a potential for common method biases (CMB), also referred to as CMV (Fuller et al. 2016). To evaluate the presence of CMB, we utilized "Harman's one-factor test" with unrotated exploratory factor analysis. The analysis revealed that the first factor accounted for 41.41% of the variance, which is below the threshold value of 50% (Podsakoff et al. 2003). Therefore, the findings indicate that this study is free from issues associated with CMB.

Furthermore, the items were tested for reliability and validity. Here, the obtained value from "average variance extracted" (AVE) is greater than 0.5 (Table 4). In addition, the "composite reliability" (CR) for all items exceeds the recommended threshold value of 0.5, indicating good "internal consistency." This study's factor loadings range from 0.8 to 0.96, demonstrating strong "convergent validity." Furthermore, as illustrated in Table 5 and Table 6, the discriminant validity assessment reveals that the square root of the "Average Variance Extracted" (AVE) is greater than the corresponding correlation coefficients. Additionally, the "Heterotrait-Monotrait Ratio" (HTMT) values

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TABLE 4 | Summary of the measurement model.

Constructs	Factor loading	Cronbach's alpha (> 0.7)	Rho_A (> 0.7)	CR	AVE	VIF
Circular economy practices (CEP)		0.929	0.930	0.946	0.778	
CEP1	0.894					3.302
CEP2	0.886					3.503
CEP3	0.843					2.475
CEP4	0.892					3.496
CEP5	0.894					3.147
Cleaner production (CP)		0.831	0.838	0.887	0.663	
CP1	0.864					2.157
CP2	0.782					1.801
CP3	0.823					1.838
CP4	0.786					1.575
Dynamic capability (DC)		0.921	0.923	0.933	0.536	
DC1	0.725					1.992
DC2	0.753					2.087
DC3	0.711					1.981
DC4	0.711					1.992
DC5	0.744					2.157
DC6	0.795					2.54
DC7	0.737					1.942
DC8	0.716					2.047
DC9	0.742					2.051
DC10	0.736					2.143
DC11	0.704					2.001
DC12	0.706					1.876
Green entrepreneurship (GE)		0.923	0.923	0.942	0.763	
GE1	0.866					2.885
GE2	0.876					3.183
GE3	0.874					2.802
GE4	0.863					2.844
GE5	0.889					3.217
Green innovation strategy (GIS)		0.939	0.941	0.950	0.732	
GIS1	0.843					2.648
GIS2	0.868					3.117
GIS3	0.863					3.043
GIS4	0.843					2.601
GIS5	0.865					3.127
GIS6	0.841					2.81
GIS7	0.865					2.99

(Continues)

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TABLE 4 | (Continued)

Constructs	Factor loading	Cronbach's alpha (>0.7)	Rho_A (>0.7)	CR	AVE	VIF
Sustainable development (SD)		0.930	0.932	0.944	0.705	
SD1	0.876					3.107
SD2	0.842					2.586
SD3	0.830					2.442
SD4	0.861					2.941
SD5	0.811					2.314
SD6	0.830					2.525
SD7	0.826					2.447

Note: CR = Composite reliability (> 0.7), and AVE = Average Variance Extracted (> 0.5).

TABLE 5 | Discriminate validity table (Fornell-Larcker Criterion).

	CEP	CP	DC	GE	GIS	SD
CEP	0.882					
CP	0.476	0.814				
DC	0.392	0.415	0.732			
GE	0.540	0.589	0.630	0.874		
GIS	0.480	0.400	0.522	0.632	0.856	
SD	0.690	0.562	0.505	0.704	0.459	0.840

TABLE 6 | Discriminate validity table (Heterotrait-Monotrait Ratio [HTMT]).

	CEP	CP	DC	GE	GIS	SD
CEP						
CP	0.533					
DC	0.416	0.47				
GE	0.582	0.666	0.678			
GIS	0.512	0.452	0.558	0.676		
SD	0.738	0.636	0.539	0.759	0.489	

confirm "discriminant validity," ensuring that each construct is distinct from others. This robust validation affirms the reliability and validity of the measurement model, confirming that the constructs exhibit good discriminant validity (see Tables 5 and 6). The reliability of our measurement scale is confirmed, as indicated by "Cronbach's alpha" coefficients exceeding the critical value of 0.7 (Hair et al. 1998). Additionally, the correlation values, ranging from 0.2 to 0.6, are well below the threshold value of 0.9, indicating the absence of multicollinearity among the study constructs. Furthermore, the significant correlations observed among certain factors provide preliminary evidence supporting subsequent hypothesis testing. In our study, we assessed multicollinearity among the influential factors by examining "Variance Inflation Factors" (VIFs), which all yielded values below 0.5. This suggests the absence of multicollinearity issues (Hair et al. 2021).

4 | Empirical Findings

4.1 | Hypothesis Testing

The structural results reveal significant positive influences for several paths. Specifically, the path from DC to GE shows a coefficient of $\beta = 0.630$ ($p < 0.01$). Additionally, GE to CP is significant with $\beta = 0.589$ ($p < 0.01$), and GE to SD is marked by $\beta = 0.409$ ($p < 0.01$). The path from GE to CEP also indicates a significant positive influence with $\beta = 0.540$ ($p < 0.01$). Moreover, the path from CP to SD demonstrates significance with $\beta = 0.127$ ($p < 0.05$) and from CEP to SD with $\beta = 0.408$ ($p < 0.01$) (Table 7 and Figure 8). In continuation with the established findings, all bootstrap outcomes pertaining to the constructs exhibit statistical significance. These results underscore the robustness of our analysis, corroborating the theoretical underpinnings outlined in the literature. We also find that SD has a positive significant effect (i.e., $R^2 = 0.641$), followed by GE (i.e., $R^2 = 0.397$), CP (i.e., $R^2 = 0.346$), and CEP (i.e., $R^2 = 0.291$). Hence, hypotheses H1, H2, H3, H4, H5, and H6 were accepted and significant. The higher value of the effect size indicates a strong path coefficient. Furthermore, the validation of "cross-validated redundancy" (Q^2 values) exceeding zero across all endogenous components substantiates the predictive precision of the model. Q^2 was derived from the PLS path model employing a blindfolding technique, with a "blindfolding procedure" (with "omission distance" (OD) = 7). This approach ensures robustness and reliability when assessing the model's predictive accuracy. Moreover, SD has the highest Q^2 value (0.103), followed by GE ($Q^2 = 0.069$), CP ($Q^2 = 0.220$), and CP ($Q^2 = 0.218$).

4.2 | Moderation Test Result

Next, the model was tested for the "moderation effects" of GIS on the relationship between DC and GE (see Table 8). The results indicate that GIS significantly moderates this relationship, as evidenced by a beta coefficient (β) of 0.129 and a p-value less than 0.05. The "coefficient of determination" (R^2) for GIS is moderate at 0.014. These moderation analysis findings are detailed in Table 8 and illustrated in Figure 9.

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TABLE 7 | Result of structural model.

Hypothesis path relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	*t*-Statistics (|O/STDEV|)	*p*-Values	95% BCa confidence interval	Q^2 (OD = 7)	Decision
CEP—> SD	0.408	0.405	0.086	4.725	0.000	[0.224, 0.564]	0.446	Supported
CP—> SD	0.127	0.132	0.064	1.98	0.048	[0.004, 0.256]	0.446	Supported
DC—> GE	0.630	0.632	0.062	10.177	0.000	[0.505, 0.749]	0.299	Supported
GE—> CEP	0.540	0.541	0.083	6.522	0.000	[0.369, 0.690]	0.218	Supported
GE—> CP	0.589	0.589	0.065	8.997	0.000	[0.450, 0.704]	0.220	Supported
GE—> SD	0.409	0.409	0.081	5.079	0.000	[0.248, 0.562]	0.446	Supported

Note: Fit indices SRMR = 0.058, chi square = 856.354, NFI (normed fit index) = 0.813, OD = omission distance.

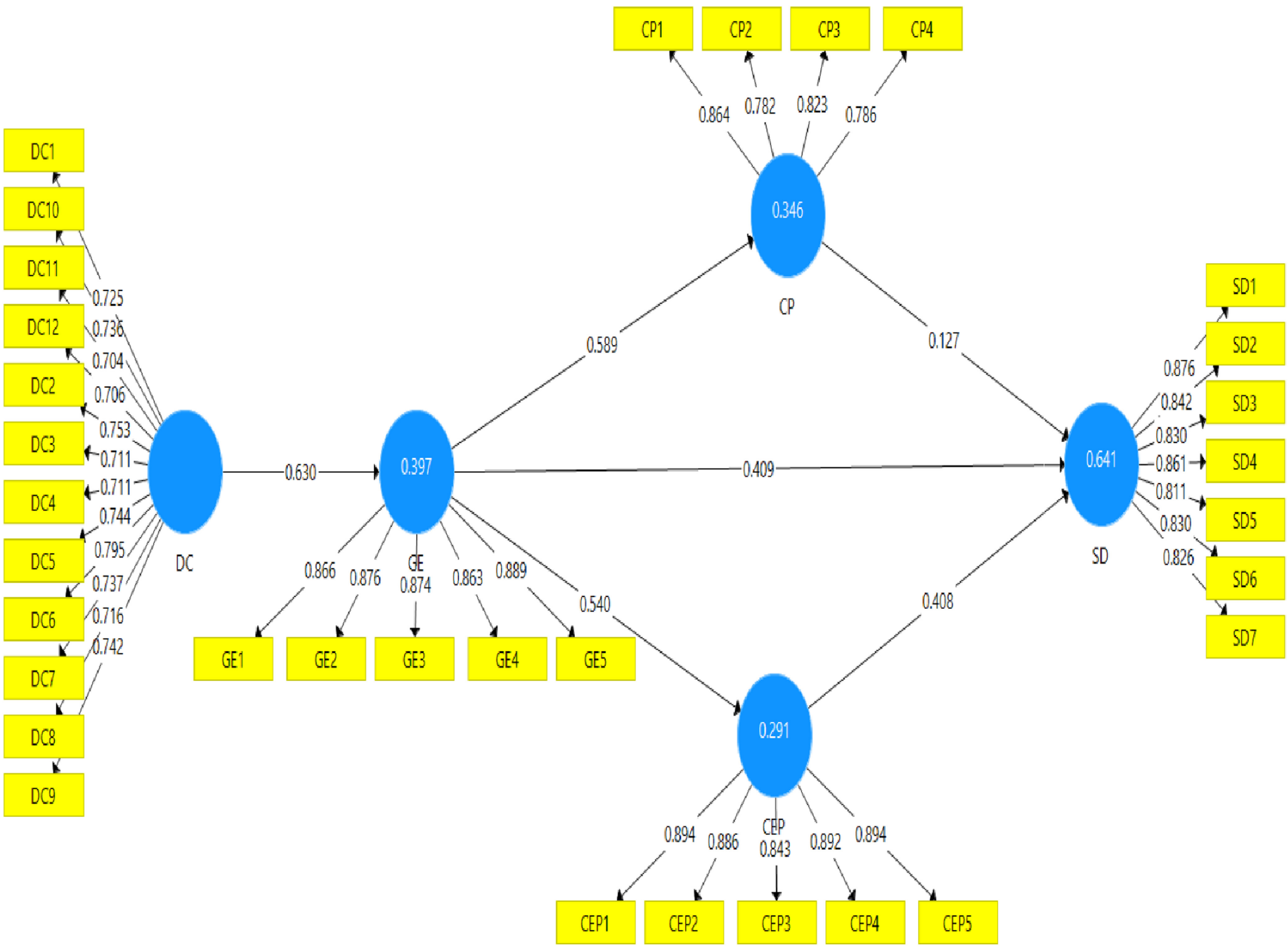

FIGURE 8 | SEM output result.

5 | Discussions, Conclusions, Implications, Limitations, and Future Recommendations

5.1 | Discussions

This research explores and delineates the relationships among DC, GE, CEP, CP, and SD. Additionally, it examines the moderating effect of GIS on the relationship between DC and GE. The results indicate that DC is a crucial driver, exerting a significant impact on GE. Furthermore, the study seeks to establish the interconnections among GE, CP, CEP, and SD. The findings reveal that both CP and CEP significantly contribute to SD. In this study, we also explore the moderating effects of GIS on the relationship between DC and GE. GIS optimization supports sustainable production and waste management activities, thereby advancing SD. Notably, our findings underscore that DC significantly influences GE, which in turn positively correlates with SD. Furthermore, GE facilitates organizational advancement in social sustainability, sustainable production, and consumption practices. Green entrepreneurs play a pivotal

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TABLE 8 | Moderation effects of GIS.

	Dependent variable: GE
Direct effect variables	
Dynamic capability (DC)	0.027
Interaction effects	
DC X GIS	0.129*
R^2 value	0.014
F value	5.139

*$p < 0.05$.

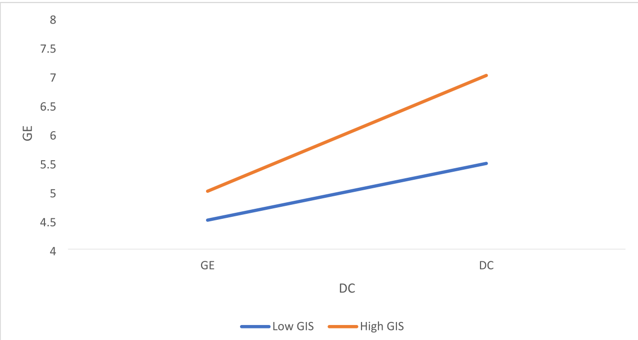

FIGURE 9 | Plot of moderation analysis.

role in integrating DC into existing business models, fostering innovation in production and operational processes, and ultimately enhancing economic growth. Moreover, their efforts in circular economy practices, such as waste management, create novel opportunities for SD. Utilizing the SPSS PROCESS macro for moderation analysis yielded significant results, confirming that GIS moderates the impact of DC on GE, aligning with previous research (Wilden et al. 2013; Schöggl et al. 2023; Guo and Tsinopoulos 2024). This underscores DC's role in fortifying organizational platforms for flexible and advanced manufacturing systems, as well as customer-centric green and sustainable product development. On the other hand, a lack of engagement in GIS is linked to a lack of desire to participate in DC and having limited GE activities in their organization. The research indicates significant implications for GE in terms of CE and SD. This finding is also inclined towards and supported by some studies (e.g., Alnaim et al. 2022). This suggests that implementing a green innovation strategy enhances the positive relationship between DC and GE in MSMEs, fostering sustainable practices and environmental responsibility. For instance, a small manufacturing business with DC adopting eco-friendly technologies experiences increased GE when it strategically integrates these capabilities, leading to the development of innovative and environmentally conscious products. This aligns with market trends and reinforces the company's commitment to sustainable business practices, positively impacting its competitiveness and market positioning. In addition to this, the relationship between DC and GE is a fascinating area of study within the realm of sustainable business. DC refers to a firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments. On the other hand, GE involves creating new ventures or adapting existing ones, focusing on environmental sustainability. Firms with strong DCs are better equipped to identify environmental opportunities, respond to regulatory changes, and innovate sustainable solutions. Further, DCs, such as seizing, sensing, and reconfiguring resources, enable firms to recognize and exploit opportunities in the green economy (Kump et al. 2019; Jiang et al. 2018; Ghosh et al. 2022). However, a firm's GIS can moderate the effectiveness of its DCs in driving GE. Firms adopt GIS as a deliberate approach to develop and commercialize environmentally friendly products, processes, or services. This strategy involves investing in research and development, collaborating with stakeholders, and aligning business practices with environmental goals. A GIS guides the allocation of resources towards environmentally sustainable initiatives. It directs DCs towards activities that support GE, including eco-design, waste reduction, and renewable energy technologies (Zhang et al. 2020). GIS assists firms in orienting their DCs to meet the demands of environmentally conscious consumers and regulatory requirements. By aligning innovation efforts with market needs, firms can create competitive advantages in green markets (Qiu et al. 2020; Li et al. 2024). A well-defined GIS facilitates the development of partnerships and networks, enhancing the effectiveness of DCs in driving GE (Dangelico et al. 2017). Furthermore, GI involves inherent risks related to technology adoption, market acceptance, and regulatory compliance. A robust GIS helps firms anticipate and mitigate these risks, enabling DCs to be more effectively leveraged for GE (Ma et al. 2022; Qiu et al. 2020; Elf et al. 2022). Therefore, the firm's GIS can enhance the impact of DCs, which serve as the foundation for GE. By aligning innovation efforts with environmental goals, firms can maximize the synergies between DCs and GE, leading to sustained competitive advantage in the green economy.

5.2 | Conclusion

In today's global landscape, where sustainability concerns are paramount, businesses face mounting pressure from various stakeholders, including the government and competitors, to adopt green and CEP. This study addresses the pressing need for sustainable strategies within the realm of GE by examining the interplay between DC, GE, CP, CEP, and SD in the context of Indian manufacturing MSMEs. Utilizing the DRBV theoretical framework, this research presents a comprehensive conceptual model that integrates these key variables. The findings reveal that GE significantly and positively influences SD, underscoring the pivotal role that green entrepreneurs play in driving sustainable practices within the corporate sector. Moreover, the study highlights the moderating effect of GIS on the relationship between DC and GE, indicating that the adoption of GIS enhances the efficacy of DC in fostering green entrepreneurial activities. By employing “Partial Least Squares Structural Equation Modeling” (PLS-SEM), this research demonstrates that DC not only directly contributes to GE but also facilitates CP and CEP, both of which are essential for achieving SD. The study also identifies the critical role of GIS in optimizing the impact of DC on GE, thereby promoting sustainable production and waste management activities that further support SD. The insights provided by this research are valuable for entrepreneurs, start-ups, and established businesses aiming to integrate green practices into

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their operations. The findings enrich the literature on entrepreneurship, the circular economy, sustainable consumption and production, and sustainability, offering a reliable model that elucidates the complex relationships between these constructs. For practitioners, particularly those in MSMEs, this study offers actionable recommendations for designing effective green or sustainability strategies that enhance production efficiency while benefiting the environment and society. Ultimately, this research contributes to the global pursuit of a greener and more resilient economy, paving the way for a sustainable and inclusive future.

5.3 | Implications of the Study

This research explores the factors facilitating the integration of green entrepreneurial practices within the framework of a circular economy, fostering ethical and sustainable business development for manufacturing MSMEs in an emerging economy. This research significantly contributes to advancing the adoption and execution of sustainable green business practices within manufacturing organizations. Moreover, the study's findings yield practical, managerial, and theoretical recommendations, enhancing our understanding and application of sustainable business practices in the manufacturing sector.

5.3.1 | Managerial and Practical Implications

The research provides significant managerial and theoretical insights into the advancement of CE across various stakeholder groups, particularly managers and businesses. The findings underscore the pivotal role of GE in promoting SD within business contexts. Specifically, the study affirms the criticality of GE in fostering CE and SD within businesses, emphasizing the need for firms to prioritize environmentally friendly practices. Managers are encouraged to cultivate and strengthen their firms' dynamic capabilities to effectively navigate environmental challenges and capitalize on market opportunities. Furthermore, the research offers practical implications for businesses aiming to integrate green practices into their corporate culture to achieve sustainability objectives. It highlights that GE significantly enhances CEP, CP, and SD. Effective implementation of CP is crucial for reducing waste and enhancing resource efficiency. Best practices in CP, such as process optimization, emissions reduction, and material recycling, are recommended. The study also advocates for CEP, which involves designing products with extended life cycles, promoting reuse, and establishing closed-loop systems. This shift from linear to circular thinking, focusing on product design, material recovery, and waste minimization, enhances productivity and efficiency as well as delivers economic, social, and environmental benefits. It equips businesses with a competitive advantage. It is recommended that senior management in manufacturing MSMEs in India prioritize the adoption of green practices. Strategies should encompass planning, organizing, and executing sustainability initiatives aligned with UNDP sustainability goals. Effective training, hiring practices, and knowledge exchange are essential for developing green practices in the manufacturing sector. Additionally, management should formulate policies and guidelines to support and regulate green initiatives for long-term business growth and success. The research further highlights that GIS plays a crucial role in moderating the relationship between DC and GE. This underscores the importance of manufacturing firms adopting strategies that foster innovation in green practices to remain competitive. Policymakers can use these insights to design and implement supportive policies, such as training programs and financial incentives. These measures can encourage MSMEs to adopt green entrepreneurship and circular economy models. This holistic approach contributes significantly to achieving both national and global sustainability objectives.

5.3.2 | Theoretical Contributions

This study offers multiple theoretical contributions. Additionally, it enriches various fields of literature, including entrepreneurship, circularity, and sustainability. This study extends the dynamic capabilities theory by linking it directly with SD outcomes in manufacturing MSMEs. It demonstrates that dynamic capabilities are not only critical for competitive advantage but also for achieving sustainability goals. This study explores the relationship between DC and various dimensions of sustainable practices, including GE, in manufacturing MSMEs. This exploration will contribute to advancing theoretical knowledge by elucidating the role of organizational capabilities in fostering environmentally conscious behaviors and driving sustainable outcomes. By empirically examining the relationships between DC and sustainable practices, the research provides valuable insight into how firms can leverage their internal competencies to promote sustainability. This expands the existing body of knowledge by highlighting the specific pathways through which dynamic capabilities influence sustainable practices and entrepreneurship. GE is an emerging and significant field. Studies indicate that GE has a substantial and positive relationship with CE, CP, and SD. Specifically, in our study, CP or CEP significantly impacted SD. By exploring how adopting a GIS moderates the relationship between DC and GE, the research will contribute to identifying strategic pathways for fostering green innovation and driving SD in MSMEs. Lastly, by addressing the identified RQ and objectives, the study will advance theoretical knowledge by providing insights into the mechanisms, factors, and strategies that underpin the promotion of environmentally responsible business practices. Moreover, by integrating concepts from organizational theory, entrepreneurship, and sustainability, the research will offer a comprehensive framework for understanding and fostering eco-friendly and resilient business environments in MSMEs.

5.4 | Limitations and Future Recommendations

The study focuses on a specific industry and country context, which may limit the generalizability of the findings to other sectors or countries. Future research should include MSMEs from different regions, sectors, or countries to enhance the generalizability of the findings. Comparative studies across countries and industries can provide a more comprehensive understanding of the relationships. This study used PLS-SEM to test the relationship, but has some limitations. For further research, consider "covariance-based structural equation modeling" or other qualitative techniques to test better structural models and model fit indicators. The study might rely on cross-sectional data, which

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can limit the ability to observe long-term effects and causality. Dynamic capabilities and their impacts on green practices and sustainability often unfold over extended periods. Conduct longitudinal studies to examine the long-term impacts of dynamic capabilities on green practices and sustainability outcomes. Finally, the limitation of this study lies in the challenge of identifying constructs that exclusively measure green entrepreneurship and the circular economy for sustainable development as distinct entities and specific industries. Additionally, empirical evidence on their impacts on performance outcomes specific to different industries remains scarce. Other limitations include the exclusion of regenerating nature practices, which have received limited attention in existing literature. Furthermore, several other factors influencing sustainability are not considered in this research. Additionally, green innovation strategy is considered a moderating variable, and there could be other significant moderating or mediating factors (e.g., market conditions, regulatory changes, and firm size) that are not accounted for, potentially influencing the outcomes.

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Appendix A

TABLE A1 | Summary of the measurement items.

Construct	Items	Code	Adopted from
Circular economy practices (CEP)	"Our MSME redesign packaging"	CEP1	(Sharma et al. 2023)
	"Investments in plastic waste prevention"	CEP2	
	"Our MSME works on renewable energy and resource"	CEP3	
	"Our MSME works on reuse practices"	CEP4	
	"Our MSME works on recycling practices"	CEP5	
Sustainable development (SD)	"Our MSME achieved profitable growth over time"	SD1	(Le et al. 2022; Lotfi et al. 2018)
	"Our MSME achieved market share growth over time"	SD2	
	"Our MSME achieve customer database growth over time"	SD3	
	"Our MSME improve resource efficiency over time"	SD4	
	"Our MSME improve environmental performance over time"	SD5	
	"The MSME proceed toward job by synergizing economic, social, and environmental factors"	SD6	
	"Our contribution to improve social welfare increases over time"	SD7	
Green innovation strategy (GIS)	"Our MSME adjusts its business practices or operations to reduce damage to the ecological environment"	GIS1	(Alnaim et al. 2022)
	"Although the government does not require it, our MSME still takes environmental remedial action"	GIS2	
	"Our MSME adjusts its business practices or operations to reduce waste and emissions"	GIS3	
	"Our MSME adjusts its business practices or operations to recycle non-renewable raw materials, chemicals, and components"	GIS4	
	"Our MSME reduces the use of traditional fuels by substituting for some less polluted energy sources"	GIS5	
	"Our MSME adjusts its business practices or operations to reduce energy consumption"	GIS6	
	"Our MSME adjusts its business practices or operations to reduce the environmental impacts of its products"	GIS7	
Green entrepreneurship (GE)	"Green entrepreneurship eliminates environmental degradation"	GE1	(Lotfi et al. 2018)
	"MSME establishes a balance between raising profit, considering the environment, and taking into account innovation and modern methods for green business"	GE2	
	"Our MSME priority is to produce products and services for profitability and green commerce"	GE3	
	"Green businesses present opportunities for making profit from ecological scopes"	GE4	
	"Green entrepreneurship serves as a driving force for triggering new economic growth in modern economies"	GE5	

(Continues)

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TABLE A1 | (Continued)

Construct	Items	Code	Adopted from
Dynamic capability (DC)	"Our MSME knows the best practices in the market"	DC1	(Schöggl et al. 2023)
	"Our MSME is up-to-date on the current market situation"	DC2	
	"Our MSME systematically searches for information on the current market situation"	DC3	
	"As an MSME, we know how to access new information"	DC4	
	"Our MSME always has an eye on our competitors' activities"	DC5	
	"Our MSME can quickly relate to new knowledge from the outside"	DC6	
	"We recognize that new information can be utilized in our MSME"	DC7	
	"Our MSME is capable of turning new technological knowledge into process and product innovation"	DC8	
	"Current information leads to the development of new products or services"	DC9	
	"By defining clear responsibilities, we successfully implement plans for changes in our MSME"	DC10	
	"Even when unforeseen interruptions occur, change projects are seen through consistently in our MSME"	DC11	
	"In the past, we have demonstrated our strengths in implementing changes"	DC12	
	"In our MSME, change projects can be put into practice alongside the daily business"	DC13	
	"Decisions on planned changes are pursued consistently in our MSME"	DC14	
Cleaner production (CP)	"Our MSME uses clean and more energy efficient technologies in capacity decisions"	CP1	(Afum et al. 2022)
	"Our MSME uses less or non-polluting/toxic materials that are environmentally friendly"	CP2	
	"Our production processes focus on using clean, recyclable and reusable materials"	CP3	
	"Our MSME redesign production and operation processes to improve environmental efficiency"	CP4	

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