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Assessing enablers of green entrepreneurship in circular economy: An integrated approach

Sourav Mondal, Saumya Singh, Himanshu Gupta *

Department of Management Studies and Industrial Engineering, Indian Institute of Technology (Indian School of Mines) Dhanbad, Dhanbad, 826004, Jharkhand, India

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ABSTRACT

In recent years, researchers have considered green entrepreneurship critical for creating new business opportunities in circular economy for sustainable development. Though many studies have been carried out in this domain recently, there are dearth of studies on how enablers of green entrepreneurship help businesses and progress toward achieving a circular economy. To fill this research gap, this study aims to identify the enablers of green entrepreneurship in the circular economy in micro, small, and medium enterprises (MSMEs) of the manufacturing sector. The aim also includes prioritizing and developing a contextual and hierarchical relationship between the identified enablers. Enablers are identified via a comprehensive literature review under the purview of management theories (namely "Dynamic Capability Theory," "Critical Success Factor Theory," and "Stakeholder Theory") and are validated by expert opinions. The "Best Worst Method" (BWM) and the "Interpretive Structural Modelling" (ISM) have been used to prioritize and develop a hierarchical contextual relationship among the identified enablers respectively. Moreover, "fuzzy Matrice d'impacts croisés multiplication appliquée á un classment" (MICMAC) analysis is employed, to compute the driving and dependence power of the enablers. The obtained result revealed that "technology-based enablers" and "effective technological infrastructure facilities" are the key enablers of green entrepreneurship under main and sub-category enablers. The findings highlight the strength of the relationship among the enablers of green entrepreneurship based on the corresponding "driving" and "dependence" power. The result also suggests that 'social norm and culture', 'an attitude towards acceptance of new technology,' 'R&D innovation capability,' and 'environmental regulation and waste management policies are critical in influencing the driving green entrepreneurship enablers of the circular economy. The study contributes to the decision-making process of government, policymakers, and all other stakeholders and also acts as a point of reference for entrepreneurs to run green-driven business practices and create sustainability-driven goods to offset the socio-economic and environmental challenges that mankind faces.

1. Introduction

In last few decades, increased customer demand has led to the growth of industrial and commercial activities. In this regard, the manufacturing sector played a significant role in economic and societal activities at the cost of the environment. They created some ecological challenges, such as environmental pollution, toxic emissions, waste generation, and depletion of natural resources (Hao et al., 2020; Zahoor et al., 2022). The only approach to solve this issue is via sustainable development (Abid et al., 2022) of the manufacturing sector. Therefore, altering consumption and focusing on cleaner production will contribute to the ecosystem (Sharma et al., 2021). It is crucial to understand the balance between industrial development and sustainable development. According to UNDP, sustainable development (SD) is the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Pacheco et al., 2010). The majority of the researchers showed that it is an approach to development that seeks balance between industry with environmental, economic, and social development. Thus, several new concepts in business strategy, such as sustainable entrepreneurship (Hummels and Argyrou, 2021), green entrepreneurship (GE) (Zhao et al., 2021), industry 4.0 (Khan et al., 2021), and circular economy (CE) (Moktadir et al., 2020) are becoming popular throughout the world because of its positive impact on society and environment. However, the implementation of these environment-friendly activities in developing countries is still a

* Corresponding author.
E-mail addresses: sourav.19dr0151@ms.iitism.ac.in (S. Mondal), saumya@iitism.ac.in (S. Singh), himanshug@iitism.ac.in, himanshuguptadoms@gmail.com (H. Gupta).

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Abbreviations

GE	Green Entrepreneurship
GEE	Enablers of Green Entrepreneurship
SD	Sustainable Development
SDG	Sustainable Development Goals
BWM	Best Worst Method
ISM	Interpretive Structural Modelling
MICMAC	Matrice d'impacts croisés multiplication appliquée á un classment (Cross-Impact Matrix Multiplication Applied to Classification)
MSME	Micro, Small and Medium Enterprises
MCDA	Multi-Criteria Decision Analysis

challenge.

A recent study by Bag et al. (2021) indicates how manufacturing businesses are increasingly placing a premium on green entrepreneurship, CE and sustainable manufacturing due to the economic, social, and environmental advantages associated with them. The achievement of sustainability has become more quintessential with respect to their corporate social responsibility (Nassani et al., 2022). However, manufacturing organizations face several challenges to meet SDG. For instance, micro, small and medium manufacturing organizations require to have a sustainable strategy, it is rare to put it into action (Crossley et al., 2021). Recognizing the significance of the manufacturing sector in micro, small and medium enterprises (MSMEs) in national and international economic and environment growth, experts are increasingly urging for leveraging activities that create and support sustainable development (Shanker et al., 2022). The objective will be achieved through green entrepreneurship (GE) and/or CE practices. The GE refers to environment-friendly start-ups that aim at creating and implementing solutions to environmental problems and contribute to society and economic growth (Mondal et al., 2022). While CE is defined as a "model of production and consumption, which consist of sharing, reusing, refurbishing and recycling existing materials and products for extending life cycle of products" (Khurana et al., 2021). Numerous studies have looked into the role of green entrepreneurship and CE in sustainable development (Lotfi et al., 2018; Suárez-Eiroa et al., 2019). Many recent researchers show GE as well as CE practices as a growth engine for sustainable development (Rahdari et al., 2016; Wang and He, 2022). The application of GE and CE practices in MSMEs manufacturing sectors may assist in developing environment-friendly entrepreneurship, solid waste management, sustainable manufacturing practices and provides a solution to sustainable development challenges (Khan and Ali, 2022; Sharma et al., 2020). As a result, it helps in the reduction of resource depletion, thereby increasing production, which finally helps in the environment, social and economic developments. GE helps businesses in developing the 4R policy, i.e., "reduce consumption", "reuse items", "recycle waste", and "remanufacturing the product", thereby aiding in a CE (Nikolaou and Tsagarakis, 2021; Patwa et al., 2021). Pacheco et al. (2010) pointed out that green entrepreneurship creates opportunities for sustainable development. Karimi and Nabavi Chashmi (2019) investigated how GE mediated the effect of green innovation, competitive advantage, organizational culture, and "social-environmental responsibility". Moreover, some studies discover about CE practices (Moktadir et al., 2020), how it is managed, its relationship with various stakeholders of the industry (Baldassarre et al., 2019), its relationship with green entrepreneurship (Nuringsih and Nuryasman, 2022), and how it creates opportunities and develop new business models (Pieroni et al., 2019). In another study (Fernando et al., 2019), management theory was linked with CE. While this study (Aranda-Usón et al., 2020; Ünal and Shao, 2019) shows CE for a manufacturing firm that aided in cleaner production and sustainable consumption. A study by Huysveld et al. (2019) created performance measurement indicators for the measuring dimensions of the CE. Govindan and Hasanagic (2018) identified the drivers and barriers. Some authors (Rizos et al., 2016; van Keulen and Kirchherr, 2021) studied CE enablers in different perspectives (Bressanelli et al., 2021; Guerra and Leite, 2021; Hussain and Malik, 2020; Mishra et al., 2019). Another study (Demirel and Danisman, 2019) shows eco-innovation and MSMEs growth in relation to the CE.

From the past studies, it is clear that none of the previous research comprehensively study GE and CE effects in a combined manner, also, there is no such attempt found in the manufacturing MSME sector. However, sufficient evidence does not exist to support the important factors or drivers' identification of green entrepreneurship on CE and SD. Though, there are limited studies available on critical factor identification of CE (Moktadir et al., 2020). Currently, MSMEs face several challenges like not having proper strategized business for cleaner production and waste management, regulatory complexities, and not having proper technological infrastructure (Gupta et al., 2020; Kannan et al., 2022; Mishra et al., 2022; Vásquez et al., 2021). The challenges that manufacturing industries face in adopting green entrepreneurship and CE are not simple because its implementation requires a strong, concentrated and unique set of abilities. The previous study indicates that manufacturing organizations had a mixed answer to the issue of whether they have green entrepreneurial capabilities for the development of CE to mitigate environmental challenges (Chauhan et al., 2022; Franco, 2017). Therefore, this is the prerequisite for the implementation of green entrepreneurship on a CE and to prevent further environmental degradation (Hina et al., 2022). Moreover, MSMEs create lots of waste and environmental pollution. To address these obstacles, it is important to identify and study the enabling factors of green entrepreneurship which help for developing CE practices. Although, no available study considers the role of enablers of green entrepreneurship playing a major role in the development of CE in MSMEs of various developing countries. Therefore, the study requires for the identification of GEEs that helps in CE growth, and to make the linkage between this. Therefore, to fulfil this gap, this study has the following research questions (RQ)-

RQ1: What are the key enablers of green entrepreneurship (GEE) and how intense is their influence upon CE and SD in the MSME manufacturing sectors.

RQ2: What are enabler-based contextual relationships and hierarchical structural model.

RQ3: How can clustering be achieved among enablers based on their driving and dependence power of GE.

To address these research questions, an integrated methodology has been used for analysis of data collected from experts of Indian manufacturing organizations. Further, MSME manufacturing sector was chosen because they have a significant contribution to any country's economy and have the potential for future growth (Khurana et al., 2021). In the beginning, using an extensive literature review and expert opinion the enablers were identified and introduced. Then management theories and experts' opinions were used in the categorization of the GEEs. Further, a thorough expert response and BWM method were used to make ranks. ISM method was used to measure interdependencies and transitive relationship of GE enablers on CE. Fuzzy MICMAC helps in segregating the GEEs based on "driving" and "dependence power". The findings reveal that among the main enablers (sub-enablers), organization-based (circular supply chain management) is the top enabler, which is followed by commercial-based (clear visibility of economic benefit), technology-based (effective technological infrastructure facility), societal-based (knowledge of waste management system), environmental-based (environmental regulation and waste management policies) respectively. This study addresses entrepreneurs and academicians in understanding the enablers of GE that help firms to develop CE and to accomplish SDG. In practice, the findings of this study will assist business organizations in developing appropriate sustainable strategies that satisfy specific demands in the long run. Further, this research will allow management to develop effective green strategies, green behaviour and attitudes towards sustainable growth. These contributions help in more in-depth insight into GEEs and show how it helps in the development of CE (such as waste management and cleaner production) in a business for sustainable development. This research has five mainly five-fold novelty on the sustainability literature. First, as green entrepreneurship and CE both are helpful in sustainable development (Gupta and Dharwal, 2022; Rodriguez-Anton et al., 2019), but till date, to the best of our knowledge, no study is there to show this relationship. Second, there are several enablers helping green entrepreneurship, but to date, no prior available research focus on this, and no study which focuses on how green entrepreneurial enablers help in CE and sustainable development. Third, this study is one of the first study where enablers of green entrepreneurship were identified from prior literature and expert opinion. Fourth this is one of the studies where three established management theories ("dynamic capability theory," "critical success factor theory," and "stakeholder theory") were used to establish the all-pervasive role of environmental, societal, organisational, technological and commercial factors. Lastly, this is the pioneering study where GEEs were identified and prioritized using BWM, developing contextual relationships using ISM and clustering through Fuzzy MICMAC analysis.

The rest of the research paper is structured as follows. Section 2 discusses the theoretical background and provides a detailed discussion of green entrepreneurship, CE, and their enablers. Section 3 comprises the research methods used in the study. While section 4 presents the illustrative application of the proposed methodology and a discussion of the case study. Section 5 shows the analysis and results of the study. Section 6 comprises a discussion of the result of this study, and section 7 provides the conclusion of this study. Finally, section 8 discusses the implications, limitations, and suggested future recommendations.

2. Literature review

Green entrepreneurship helps in the environmental as well as economic development of a business (Gupta and Dharwal, 2020). It is important to identify the enablers that are efficient in minimizing carbon footprint, responsible for economic and environmental development, and ensuring sustainability. There are several ways that help in improving organizational sustainable performance; one way is to manage waste, which finally helps in developing CE practices in an organization. Although GEEs are essential for the development of CE, little attention has been provided in past literature. Hence, using past literature, three theoretical perspectives (dynamic capability theory, critical success factor theory, and stakeholder theory), and expert opinion were used in this study for enabler identification. A detailed discussion of the GEEs is provided below.

2.1. Green entrepreneurship

Green entrepreneurship (GE) is mostly studied from non-traditional entrepreneurship and addresses environmental issues and creates economic value through the creative recombination of resources (Jiang et al., 2018). Green entrepreneurs exhibit a willingness to make a profit, while the firm can work for ecological or environmental development (Hasan et al., 2019). Past studies emphasize that green entrepreneurship plays a significant role in CE implementation with sustainable development (Chen et al., 2020; Johnson and Schaltegger, 2020). According to some studies, green entrepreneurs engage in identifying market opportunities, gain access to resources (like reusing waste as resources), and make businesses profitable in the long run, with some innovation besides managing risk and uncertainties (Zucchella and Previtali, 2018). These type of entrepreneurs also focus on developing a profitable venture while considering the environment and development towards sustainability (Gast et al., 2017; Lüdeke-Freund, 2020). As climate change and global warming take place, government policy and consumption patterns change, and demand for cleaner or sustainable products increases (Wu et al., 2021). It creates more opportunities for green entrepreneurs to develop environment-friendly products such as waste management, energy-saving appliances, and environment-friendly production processes. Earlier studies found that green entrepreneurship helps to create environmental value and is driven by social and ethical motives (Haldar, 2019; Hasan et al., 2019; Muangmee et al., 2021; Nulkar, 2014). A recent study Muangmee et al. (2021) shows that green entrepreneurship makes a huge contribution to environmental improvement in developing and underdeveloped countries. In India and other nations, the role of green entrepreneurs lies in solving environmental problems while considering societal and economic welfare as well.

2.2. Circular economy (CE)

The concept of CE has gained momentum in the present business environment among the manager, regulators, and stakeholders for achieving SDG (Kristoffersen et al., 2020). It is process of transitioning linear business operations to a circular business model (Moktadir et al., 2020) (Fig. 1). Here, used and waste materials are "reintroduced" into the business in a "closed-loop system" through the use of "recycling," "reusing," "reprocessing," and "refurbishing" as a means of retaking the values and reducing negative impacts (Kusi-Sarpong et al., 2021) (see Fig. 1). Waste generation from manufacturing may be significantly reduced by adopting CE practices (Aranda-Usón et al., 2020). Many researchers and experts in developed nations have shown significant interest in CE practices for waste management (Kazancoglu et al., 2021). According to a past study, GE helps in cleaner production practices, which ultimately helps in circular product design strategies and are important to CE development in an organization (Schroeder et al., 2019; Sousa-Zomer et al., 2018). The cleaner production practices by entrepreneurs help in reducing the use of natural resources and increasing waste management, i.e., recycling resources. Moreover, green entrepreneurship implementation facilitated cleaner production, eco-friendly product creation, and waste management activity as part of the development of a circular business strategy (Sousa-Zomer et al., 2018). In addition, there is a close-knit relationship between the CE and sustainability (Tapaninaho and Heikkinen, 2022). Another study by Nuringsih and Nuryasman (2022) shows the relationship between the behavioural factor of green entrepreneurship, such as green entrepreneurial education, green entrepreneurial intentions and environmental citizenship behaviours, having a significant impact on perceived CE. This study's findings also show that environmental aspects address sustainability through the development of CE. Study by Shishcan and Kaim (2020) shows GE helps in the development of all the possibilities to CE. This study shows entrepreneurs help in developing "ecologophilic technologies," "organic technologies," "saving natural resources technologies," "compensation technologies," and "recycling technologies" thereby helps in making sustainable products. Among them, compensation and recycling technologies help in the development of CE (Alonso-Almeida et al., 2021). The study also shows entrepreneur involvement supports shifting conventional business to green and sustainable business (Nuringsih and Nuryasman, 2022). As CE helps simultaneous improvement of the environment, economy and social and contributes to sustainable development, green entrepreneurship and CE both are helpful to sustainable development. Green entrepreneurship is a promising driver for operational efficiency and competitive advantage in pursuit of a higher level of traceability and applicability of CE for sustainable development (Del Vecchio et al., 2021; Nuringsih and Nuryasman, 2022). However, the relationship between green entrepreneurship and CE is unclear from the past study. Further research is needed to understand how green entrepreneurship enablers contribute to CE and sustainability. Table A1 (see Appendix A) summarizes previous studies on green

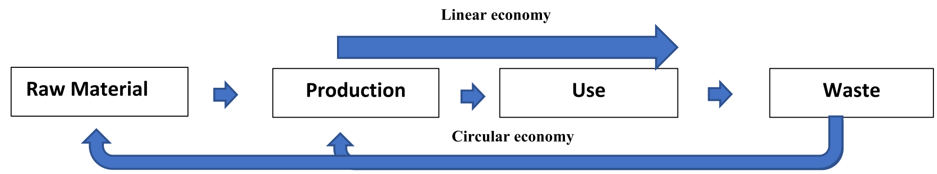

Fig. 1. Diagram of linear and circular economy (Authors' compilation).

entrepreneurship, CE, and sustainable development.

2.3. Past studies on green entrepreneurial enablers to circular economy

This section reviews various studies and provides a detailed discussion of GEEs that help businesses for CE and SD. The manufacturing sector has made a valuable contribution to economic development throughout the world. For example, MSMEs have a 35 percent contribution to the world GDP and 30.5 percent to India's GDP (Stadnyk et al., 2021). Although this sector has a major contribution to the GDP, it negatively impacts the environment by generating waste. Hence this sector needs to develop adequate strategic planning is required for the execution of GE for CE. India is facing severe resource and environmental problems in its manufacturing sectors due to rapid development and an increase in consumption (Xiong and Xu, 2021). The integration of green entrepreneurship and circular utilization of resources is the only potential solution. It also helps in alleviating the use of waste but also effectively reduces adverse environmental effects. According to some studies, economic growth is simultaneously increasing social and economic welfare (Surya et al., 2021). However, rapid industrial development and substantial advancements in technological innovation have resulted in the industrial revolution with waste generation (Yu et al., 2022). Therefore, in the present era, waste is a major problem with a scarcity of natural resources. While business tries to minimize waste by reusing, recycling and remanufacturing (de Oliveira Neto et al., 2022), here the role of the CE comes in because it is based on the 3R concept ("reduce," "reuse," and "recycling") and also has a strong link between the economy and the environment (Morseletto, 2020; Nuringsih and Nuryasman, 2022). Some researchers believe that both linear and open-ended economies significantly impact sustainable development (Murray et al., 2017). However, most of the past studies ignored the economic benefits that were generated from recycling (Potluri and Phani, 2020; Qazi et al., 2020). The economic-environmental relationship is expanded to account for the natural environment's integrated and sustainable waste management, non-recyclable resource disposal, and non-renewable or exhaustible resources (Alidoosti et al., 2021). Increasing environmental deterioration throughout the world has resulted in policy changes to reduce the negative ecological repercussions of production and consumption. Several nations are reforming their policies and focusing more on the recycling principle of a CE to execute closed-cycle waste management and provide ecologically friendly waste disposal and assimilative waste capacity. Academicians and business organizations have recently focused on green entrepreneurship and CE since it improves cleaner production and consumption, and sustainability (Pan et al., 2022). Green entrepreneurship and CE have huge potential in the industrial sector in moving towards sustainable growth (Hina et al., 2022). It helps businesses in achieving better production, manufacturing operation and sustainability activity. Manufacturing businesses this day shifted to green and sustainability activity (Moshood et al., 2022).

According to findings, manufacturing organizations have recognized the value of green and circular activities for sustainability. As green activities become critical in manufacturing in the present era, it motivates businesses to do environmental activities and waste management for sustainability (Moshood et al., 2022). The efficient use of waste management helps businesses in two ways, i.e., reducing the consumption of natural resources and developing environmental sustainability with economic and social sustainability (Sarikaya et al., 2022). Recent research, although small number of studies, has attempted to identify the enablers of a CE. For example, Hussain and Malik (2020) conducted a study to identify organizational enablers of a CE in the context of supply chain management. They found supply chain, collaboration, and environment-related enablers. Another study by Rizos et al. (2016) identifies barriers and enablers of CE for SMEs. The result indicates that environmental and cultural, financial support, recognition, personal knowledge, and government support are key enablers. Moktadir et al. (2020) identified ten critical success factors of the CE. Patel et al. (2021) identified enablers of CE in manufacturing firms, assessed them, and developed an inter-relationship among each enabler. The study found that top management commitment, organizational structure, and organizational culture are the key enablers. In addition, there are several studies on CE identification in different contexts (Alonso-Almeida et al., 2021; Dissanayake and Weerasinghe, 2022; Mishra et al., 2019). Makki et al. (2020) in their study they identified the barriers of green entrepreneurship. They identified twelve barriers and made clustering based on their driving and dependence power. Another study by Pandrani and Ferguson (2013) shows enabling factors of green entrepreneurship, while Mukonza (2020) studied factors that effect green entrepreneurship in South Africa. Hence, from the literature review, it is clear that the understanding and identification of green entrepreneurship enablers will play a pivotal role and can be a critical factor between the failure and successful implementation of CE.

According to findings, manufacturing organizations have recognized the value and need for GE and CE practices. Researchers have identified various factors; however, recent research indicates that various technological, organizational, economic, societal, and environmental factors are appropriate (Al-Mawali et al., 2018; Le et al., 2022). The scenario necessitates the identification of appropriate methodologies, processes, and applications of green practices. The following section presents GEEs.

2.3.1. Technology-based enablers

These are the factors that are associated with the technological-related factors (i.e., technological infrastructure) of GE, which help in reducing adverse effects on the environment. Manufacturing MSMEs can get benefit from the adequate technology and technological infrastructure that helps businesses for the CE and SD practices. This type of enabler helps in developing businesses to become more technically proficient and flexible, facilitating the refinement of the existing traditional technologies to leverage green innovation to meet sustainability objectives and gain a competitive advantage (Gupta and Barua, 2016). The availability of efficient technology can aid in the effective adoption of best innovation practices for managing waste, increasing efficiency, and helping develop efficient production processes for becoming more sustainable businesses. According to Khan et al. (2021), technology has an essential role in the contribution to the circular transformation and is a key enabler for the industry in solving social and environmental problems. The technological enabler in a business helps a business to CE process to create a value chain (cleaner production and eco-design) and also provides competitive advantages (Khan et al., 2021). Therefore, several vital technological factors from the past literature considered here such that effective technological infrastructure facility (Khan et al., 2021; Salvador et al., 2021), R&D and innovation capability (Khan et al., 2021; Li et al., 2019; Soh and Wong, 2021), development and acquisition of cleaner production technology (Lahane et al., 2022; Murray et al., 2017), and availability of capital to carry out innovative initiatives (Lahane et al., 2022).

2.3.2. Commercial-based enablers

Commercial enablers are very important group of enablers that help the development of a suitable strategy for green and sustainable development. The commercial base is crucial for developing efficient technological infrastructure, helps develop proper waste management and carries out sustainability activity (Pancholi et al., 2019). Commercial and financial factors are the most important factors for the entrepreneurial MSME, which substantially impact their growth (Games and Rendi, 2019). In addition, proper commercial and financial modelling helps in cost management and financial benefits (Abou Taleb and Al Farooque, 2021). According to Korhonen et al. (2018) very good financial or commercial base helps in successful CE development. Mikalef et al. (2020) suggested that the availability of financial resources is one of the significant factors for the adoption CE enabled technology. Therefore, commercial enablers consist of the availability of capital to carry out innovative initiatives (Lahane et al., 2022), clear visibility of economic benefit (Genovese et al., 2017; Kuo and Chang, 2021; Schaltegger and Burrit, 2018), and reward, recognition, and financial support system (Chen et al., 2020); Corona et al., 2019).

2.3.3. Organization-based enablers

These are the enablers related to the organizational structure and management of the manufacturing business. This is one of the most crucial dimensions for the development of CE (Hussain and Malik, 2020). Sufficient management support and commitment entail sharing sufficient information and encouraging eco-innovation (Orji et al., 2019). Other factors, such as technological and commercial factors, this factor helps management for achieving stakeholders' objectives. The organizational factor also plays a crucial role in budgetary control and investment management in CE practices. Another aspect of this factor is to manage the workforce, achieve transparency and motivate businesses towards CE and SD (Bag et al., 2021). Kreiser et al. (2021) suggest that knowledge of the implication of CE is another organizational aspect. Therefore, the dimension of organizational-based enablers used in this study are organizational strategic planning (Barros et al., 2021; Chembessi et al., 2022), entrepreneurial simplicity, flexibility, and cooperation (Corona et al., 2019; Majumdar and Sinha, 2018), circular supply chain management (Burke et al., 2021; Farooque et al., 2019; Habib et al., 2020; Majumdar and Sinha, 2018; Ying & Li-jun, 2012), corporate social responsibility and business ethics (Dwivedi et al., 2012; Mazzucchelli et al., 2022; Suchek et al., 2021), and organizational performance assessment of waste management (Ikram et al., 2020; Kazancoglu et al., 2018; Nikolaou et al., 2011).

2.3.4. Societal-based enablers

In manufacturing MSMEs implementing green and CE practices, societal-based enablers are the most important. The social norm and culture are the important enabler in this dimension (Horne and Fichter, 2022; Rovanto and Finne, 2022). Like all other factors, this enabler, directly and indirectly, guides employee behaviour and helps businesses to CE practices. Another important societal enabler factor in this study is knowledge of waste management systems (Fatimah et al., 2020; Sharma et al., 2021). This factor helps businesses to save the environment by managing waste and also helps in the development of a strategy for waste management. Further, an attitude of acceptance of new technology is another vital dimension in our study (Coderoni and Perito, 2020; Rizos et al., 2016). This societal enabler considers the positive or negative attitude and belief towards the development of the CE for SD.

2.3.5. Environmental-based enablers

These are enablers are linked with the environmental dimension and help to successfully implement CE and achieve sustainability in the manufacturing MSMEs in India. Due to several complexities and lack of funds, most of the MSMEs provide less attention to this factor. In addition, environmental enablers have a positive and strong relationship with green or circular practices and SD (Khan et al., 2021). According to Yadav et al. (2020), environmental enablers help businesses to perform better towards environmental protection and economic gains. In this study, Sharma et al. (2020) show that environmental-based enablers help in waste minimization, enhance sustainability and provide a competitive advantage. Thus, to implement CE, there are several enabling factors such as hazard and solid waste management (Loh et al., 2020; Sharma et al., 2021), inter and intra-organization collaboration (Amjad et al., 2022; Wu, 2013; Yadav et al., 2019), and environmental regulation and waste management policies (Chen et al., 2020; Dagilienė et al., 2021; Dong et al., 2021) required.

A detailed literature review with their categorization of all GEEs is represented in Table A2 (see Appendix A) and Fig. 3 (conceptual hierarchy of the model).

2.4. Theoretical framework

In order to develop a comprehensive understanding of enablers, it is imperative to develop a theoretical foundation. In previous studies, researchers identified barriers and opportunities of green entrepreneurship, have lack of theoretical background. In addition, GE or CE is are relatively new concept. There has a scarcity of research and theoretical framework for identifying and analysing enablers. Although there is a paucity of research explaining how stakeholders, regulators, and organizations influence the enablers of green entrepreneurship on business and help in CE and sustainable development. After carefully analysing the past studies and explaining the enablers obtained from experts, we adopted three different theoretical lenses to understand the enablers. The theoretical foundations of this study are based on dynamic capability theory, critical success factor theory, and stakeholder theory.

2.4.1. Dynamic capability theory (DCT)

This theory deals with the way businesses factor, develop and reconfigure their internal and external business-specific capabilities into new capabilities that are essential in the present dynamic environment (D. yuan Li and Liu, 2014; Santa-Maria et al., 2022). This theory extends the traditional resource-based theory of the firm into dynamic environment contexts (Barney, 1991; Santa-Maria et al., 2022). The theory can be defined as "specific organizational process, creating value in business in a dynamic market environment, manipulating resources, (..) which helps firms to achieve new resource configurations" (Eisenhardt and Martin, 2000; Santa-Maria et al., 2022; Sirmon et al., 2007). The theory indicates that businesses with higher dynamic capability outperform the firms with lower dynamic capability and attain a competitive advantage. In a business, dynamic capability helps in the effective manipulation of the adoption of new opportunities and extends, alters, and develops the capability of resources. According to the study (Teece, 2010), DCT can be classified as sensing (which allows the use of firms' internal & external capabilities, identifying opportunities and threats), seizing capabilities (process and structure of these capabilities and opportunities), and reconfiguring capabilities (refers to continuous strategic alignment of tangible and intangible resources). Previous studies (Jiang et al., 2018; Santa-Maria et al., 2022) suggest this theory helps to identify sustainability-related factors, which further aid in the development of strategies for running successful businesses. Adapting green entrepreneurship practices consists of a high level of uncertainties and risks. Although this theory helps firms to identify, assess and explore the potential capabilities and opportunities in a changing business environment and market turbulent condition (Gupta et al., 2020). As a result, this helps a new perspective in a business to dynamic, overcome risk, and get a competitive advantage. Hence, this theory helps enterprises to maintain good strategical relationships with their stakeholders.

2.4.2. Stakeholder theory (ST)

This organizational theory is concerned with the interconnected relationship between a business with its stakeholders (customers, suppliers, and investors) and how a business creates value with its stakeholders (Ramoglou and Zyglidopoulos, 2021; Sen and Cowley, 2013). According to this theory, a business should involve in sustainable practices to fulfil the legitimate interests of stakeholders. Hence ST is widely used in several research areas like entrepreneurship, CE, and sustainability (Alkhuzaim et al., 2021; Bischoff, 2021; Neumann, 2021). Stakeholder theory in business operations conceptualizes the relationship of stakeholders to create value for sustainability (Freudenreich et al., 2020). Hence, the stakeholder theory is considered as a robust theoretical lens which helps understand sustainability concepts such as green entrepreneurship and CE (Jabbour et al., 2020). According to ST, the business should develop the capability for fulfilling the demands of the stakeholder (Litvinenko et al., 2022). With this, the stakeholder theory helps to development of efficient organizational strategies for the development of sustainability practices. In addition, the stakeholder influence and participations help firms' successful adoption and development of green entrepreneurship and further CE initiatives (Hina et al., 2022). Some studies suggest that stakeholder exerts a positive influence on organizational economic, social and environmental performance (Tang and Tang, 2012). Through the development of sustainable activities, stakeholders play a crucial role. The stakeholder theory found many applications in entrepreneurship and CE literature (Hull et al., 2021; Ramoglou and Zyglidopoulos, 2021; Wang et al., 2022). Thus, considering the presence of stakeholders plays a crucial role in GE and its enablers for CE and sustainability-related activities. However, a limited number of studies used ST for entrepreneurial enabler identification. Therefore, in this study, it is imperative to understand the role of stakeholders and the identification of different green entrepreneurial enablers for CE and sustainable development.

2.4.3. Critical success factor theory (CSFT)

This management theory focuses on a limited number of key success factors where satisfactory outcomes will ensure the achievement of desired goals (Moktadir et al., 2020). According to some studies, this theory can be used in any business (such as profit or non-profit, large-medium and small) to successfully select appropriate success factor that helps in achieving organizational goals (CE and SD goals) (Agrawal, 2021). The origin of critical success factor theory concept was formed from the Pareto principle (Kannan, 2018). This theory helps in the identification of 20 percent of factors which have an 80 percent contribution to the output (Bhatia et al., 2022). Hence, this theory helps to develop a business's economic, social, environmental as well as competitive advantage (Kannan, 2018). In any organization, many factors influence organizational strategic decision-making. Among them to identify the main enabling factor that affects the most is essential. For this, CSFT helps businesses to focus on the most important factor and, in a smarter way, reach the desired sustainability goals. In addition, this is also considered a tool for measuring organizational performance. The critical success factor theory has been used in several studies in the field of sustainability research (e.g. (Kannan et al., 2022),), entrepreneurship research (e.g. (Mondal et al., 2022),) CE (e.g. (Kannan, 2018; Orji et al., 2020),), in the supply chain (e.g. (Shanker et al., 2022),) and barrier and driver identification (e.g. (Kannan, 2018; Orji et al., 2020; Shankar et al., 2018),). Most of the previous studies used this theory for the sustainability aspects. However, to the best of our knowledge, none of these studies has employed this theory for the identification of enablers of green entrepreneurship. Hence, CSFT in this study is considered for the identification of important enablers of a business that helps businesses to develop a CE as well as sustainability.

Researchers insist that integrated theoretical aspects are needed as a lens to applying and determining the enablers that help businesses for sustainable development. Nevertheless, the identification of enablers of green entrepreneurship is important to develop sustainability-related activity, i.e., CE (Alonso-Almeida et al., 2021). Hence, for the enabler identification and categorization, we have used DCT, ST, and CSFT as theoretical foundations. Here, with the past literature, these three theories provide a theoretical lens as well as a logical basis for identifying relevant GEEs. The enablers presented in Fig. 2 were obtained from the literature review and expert opinion. In addition, Fig. 2 illustrates the theoretical background that links the enablers and the theoretical concepts originating from the three theories.

2.5. Research gap

Based on past studies, few gaps have been identified. The concept of circularity has been widely explored in the past literature (Moktadir et al., 2020), but the role of entrepreneurship in the implementation of CE at the micro level remains unexplored. In addition, a few studies (Karimi and Nabavi Chashmi, 2019; Khan et al., 2021; Kimjeon and Davidsson, 2021) have identified and analysed enablers of the supply chain, CE, entrepreneurship, and sustainability specific, and they are confined only in the context of developed countries. To the best of our knowledge, however, no previous study has identified enablers of green entrepreneurship and examined its relationship with CE and sustainable development under the purview of management theories. As discussed earlier, most of the previous studies focused on barrier identification, and fewer studies have been involved in the enablers identification, though they either focus on large-scale industries (Hussain and Malik, 2020) or have less number of studies on manufacturing MSMEs. Although, the available literature mostly concentrates on the exploration of green entrepreneurship and its effects on production and distribution systems, environmental development, and sustainable development at a broad level (Neumann, 2022; Pertuz et al., 2021). Very few research findings are available that consider the aspects of CE enablers (Patel et al., 2021), and still, a comprehensive set of enablers in association with green entrepreneurship with CE and sustainability of a manufacturing organization is not yet proposed. In addition, there is no single study on green entrepreneurial enablers in circular business. From the past study, it is also clear that most of the study is from developed countries, but less study focuses on developing countries and underdeveloped countries. Thus, identification and analyse of GEEs required, because it helps to develop CE in the Indian MSME manufacturing context. Few studies identified and analysed enablers using exploratory research (Tleuken et al., 2022). However, the studies identify and analyse the enablers of GE in emerging economies are scarce. With this, to the best of our understanding, no studies have prioritized GE enables according to relative importance (and/or priority) of the enablers (i.e., most and less important). Moreover, no past studies used the causal relationship of enablers of GE and CE which help development of sustainability. Previous studies used different theoretical background for enablers/drivers/barriers identification and till date no past studies used combined DCT, CSFT, and ST management theories to categorize these identified GE enablers. Furthermore, some past studies used different tools for enabler identification (Mishra et al., 2019; Patel et al., 2021), but to the best of our knowledge no study used integrated BWM-ISM and fuzzy MICMAC analysis for prioritize enablers of GE for CE, and shows interrelationship besides clustering them in manufacturing MSME sectors.

3. Research methodology

To fulfil research objective, this study used a three-phase methodology to identify and evaluate enablers of GE, which helps businesses for CE and sustainable development. The phases of the research methodology adopted for this research paper are shown in Fig. 4. In the first stage of this study, we used past literature from several scholarly databases (i.e., ScienceDirect, Wiley, Emerald, MDPI, Google Scholar, Taylor

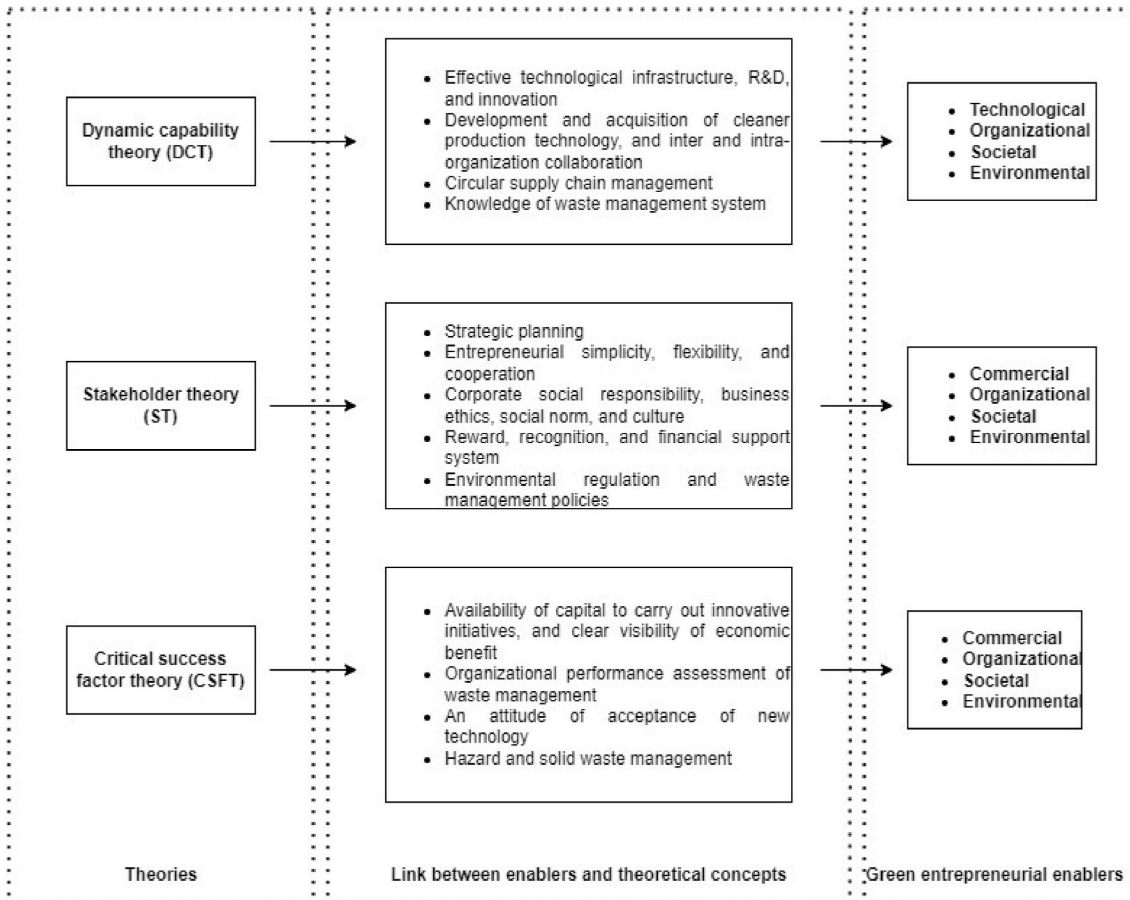

Fig. 2. Theoretical framework of the study (Authors' compilation).

and Francis and Springer) to gather relevant material. Further, enablers of "green entrepreneurship" in "circular economy" and "sustainable development" are used as keywords to get a relevant research paper from the above-mentioned database. The inclusion criteria used for data collection are that all the articles published between 2002 and 2022, the research article, the conference preceding's, and book chapters published in English are considered. The published research articles other than the English language are excluded from this study. Then articles were refined as per our research objectives. From the selected research materials, the enablers were finalized and verified by the experts. Further, theoretical framework and expert opinions were used to categorize the critical enablers of green entrepreneurship (see Tables A1 and A2 from Appendix A). A qualitative study involving opinions from the experts to verify and finalize the enablers was inculcated. The Best Worst Method (BWM) was applied to the selected enablers, and computed ranks were assigned based on ratings obtained ratings from the experts. BWM also helps in assessing the importance of GEEs with respect to corresponding sub-enablers by the expert. To test the developed framework, different types of manufacturing organizations (i.e., textile, steel, electric component, and engineering goods manufacturing MSMEs) were randomly selected, and their green as well as sustainability were assessed based on the framework. Then Interpretive Structural Modelling (ISM) was used to analyse the complex influence as well as the directional relationship among the enablers besides developing a "multi-level hierarchical structure". As these two methods complement each other, it is; therefore, an integrated decision-making framework (as shown in Fig. 4) was used to fulfil our research objectives. The detailed research methodology applied in this research for analysis is described in Fig. 4. Finally, Fuzzy MICMAC analysis is used to classify the GEEs based on their driving as well as dependence power.

3.1. Best-Worst method (BWM)

The BWM was developed and used by Rezaei (2015), and it is one of the most popularly used and efficient "Multi-Criteria Decision Analysis (MCDA)" techniques used for obtaining criteria weights from experts (Rezaei et al., 2018). It is widely used because BWM has several advantages over other mostly used MCDA techniques, such as Analytic Hierarchy Process (AHP)/fuzzy AHP, because it requires relatively fewer pairwise comparisons for the same number of criteria with consistent results (Rezaei, 2015). Another advantage of BWM is that the existence of integer values in ranking lowers the computing effort, as opposed to fractional values in AHP (Tarei et al., 2021). The other advantage of BWM is that the final weight derived from this method is more reliable than other MCDM methods and is also more robust than others (Rezaei, 2015, 2016). In the present day, BWM has several applications in various fields, such as ranking enablers of innovation (Gupta et al., 2020; Singh et al., 2021), entrepreneurship (Mendes et al., 2022), CE (Zhao et al., 2018), supplier selection (Rezaei et al., 2016), and supplier evaluation (Bai et al., 2019), and evaluating firm and quality assessment (Gupta et al., 2020). In the "BWM" analysis, the "most important" GEEs enablers/sub-enablers are considered as "best", and the "least important" are considered as "worst" enablers/sub-enablers. And this feedback was obtained during data collection from each selected industry expert. Table 2 presents the summary of the "best" and "worst" GEEs enablers/sub-enablers based on obtained feedback from each expert (see Table A2 (Appendix A)). The "pairwise comparison" of best enablers/sub-enablers is ranked in a corresponding category enablers/sub-enabler on a scale of 1–9. Here, 1 indicates "equal importance", and 9 indicates "extreme importance". The detailed steps of the Best-Worst methodology are described below (Rezaei, 2015,

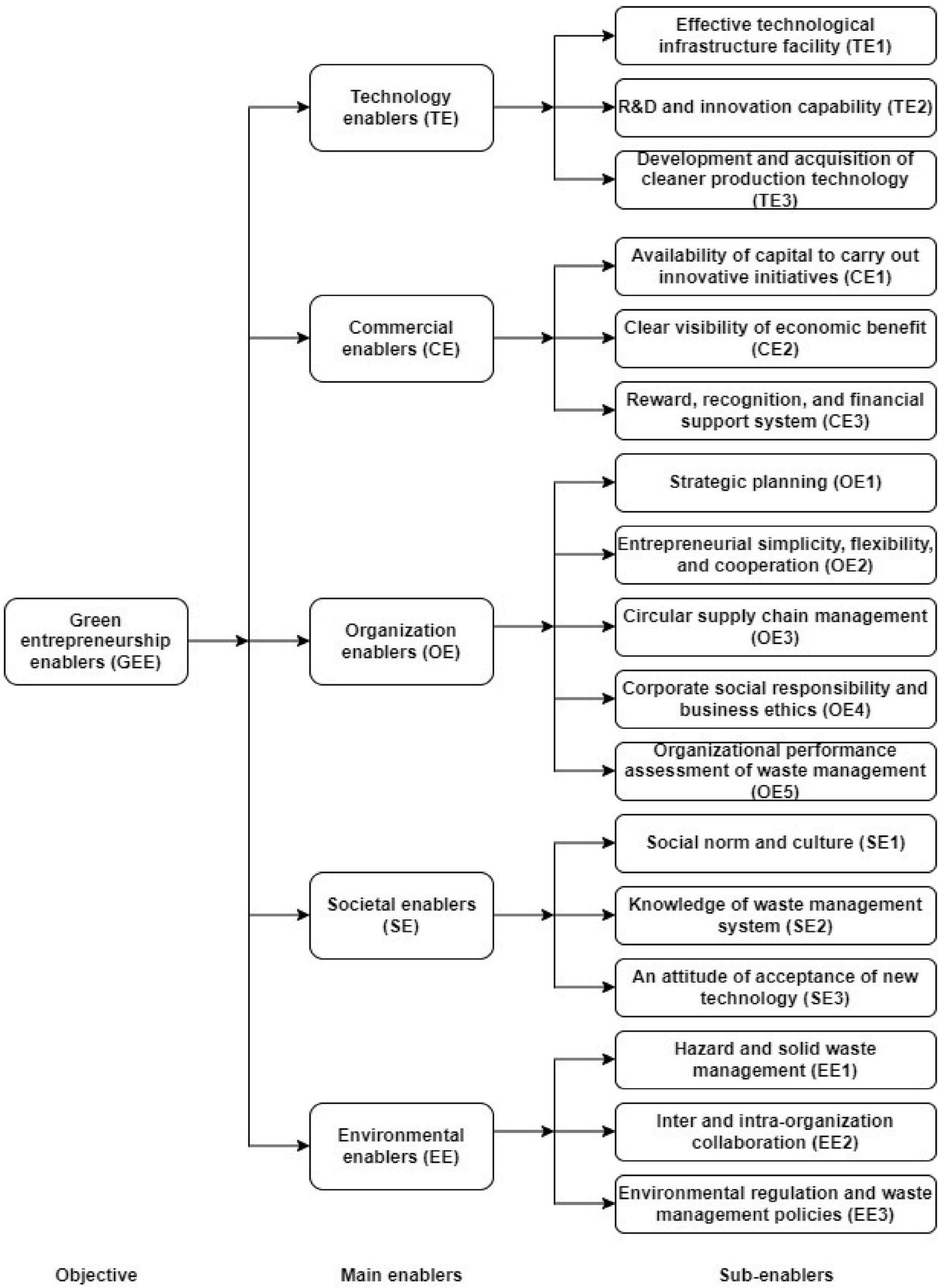

Fig. 3. Conceptual hierarchical model of GEEs (Authors' compilation).

2016).

The BWM is a "multi-criteria decision modelling" (MCDM) method where the weight vector is $w_j = (w_1, w_2, \ldots, w_n)$, and it needs $\sum_{j=1}^{n} w_j = 1$, and $w_j \geq 0$. Each w_j is a weight of the associated criteria c_j. The c_j may be viewed as a random event from the probability standpoint, and the w_j represents its likelihood of occurrence.

Step 1: Determine the set of relevant criteria for the study; if there are n criteria, then $\{c_1, c_2, \ldots, c_n\}$ used in decision criteria.

Step 2: Once the criteria have been finalized, select the "Best" and "Worst" criteria from among the main and sub-criteria. In this stage, select the "best enabler" here represents the "most important" GEEs, whereas the "worst enabler" represents the "least important" GEEs.

Step 3: The decision maker compares the best enabler to the other enabler. The assessment scale spans from 1 to 9 linguistic scale, where one denotes that it is "equally significant", but scale 9 denotes that it is "extremely important". From this we get vector $A_{Bj} = (a_{B1}, a_{B2}, \ldots, a_{Bn})$. where a_{Bj} denotes the significance of the best criteria B over criterion j.

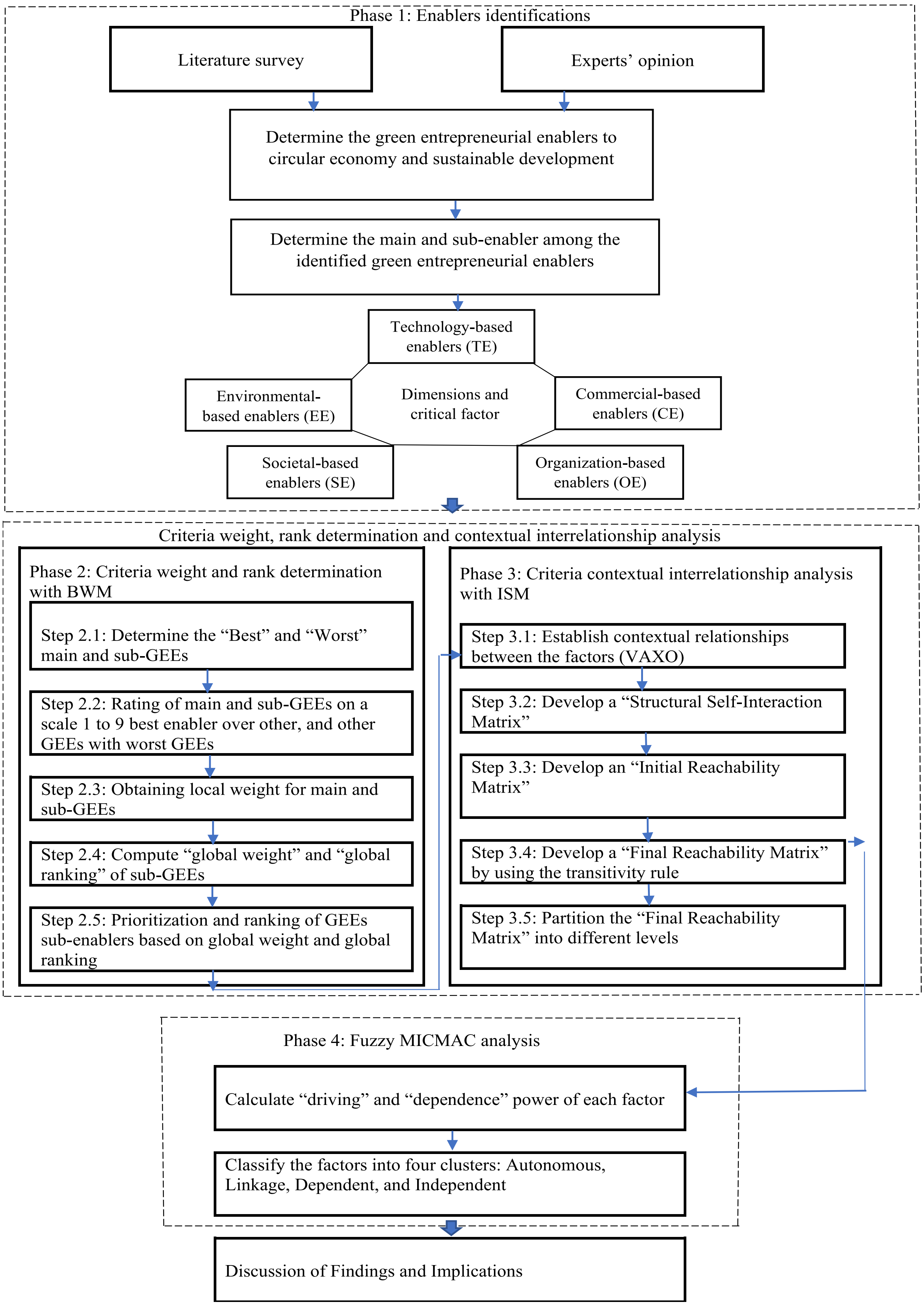

Fig. 4. Schematic diagram for phases of the methodology (Authors' compilation).

Table 1
Details about the background of experts.

Expert	Designation of the expert	Education	Year of experience	Industry type
Expert 1	Senior manager	B.Tech	10	Textile industry
Expert 2	Senior operation manager	B.Tech	7	Automobile parts components
Expert 3	Production manager	B.Tech	5	Automotive industry
Expert 4	Production and operation Manager	MBA	11	Manufacturing of engineering goods
Expert 5	Operation manager	B.Tech	7	Leather products manufacturing
Expert 6	General manager	B.Tech	17	Steel manufacturing and processing
Expert 7	Senior manager	B.Tech	13	Wood and furniture products
Expert 8	Manager production planning and control	B.Tech	9	Textile industry
Expert 9	Marketing Manager	MBA	10	Electric component manufacturing industry
Expert 10	General manager	B.Tech	12	Ceramic products
Expert 11	Production and operation Manager	B.Tech	15	Engineering and fabrications
Expert 12	General manager	M.Tech	9	Glass product manufacturing industry
Expert 13	Marketing Manager	MBA	12	Manufacturer of Engineering Goods

Table 2
The experts' rating of "Best" and "Worst" enablers and sub-enablers by expert.

Enablers	"Best" enablers by expert	"Worst" enablers by expert
Main enablers		
TE	1, 9, 13	4
CE	4, 7, 12	8
OE	2, 3, 8, 10	5
SE	6, 11	3, 10, 12
EE	5	1, 2, 6, 7, 9, 11,13
Sub-technology enablers		
TE1	1,2,4,7,9,12	3,8,13
TE2	3,6,11,13	2,5,7,10
TE3	5,8,10	1,4,6,9,11,12
Sub-commercial enablers		
CE1	2,11,13	1,3,5,8,12
CE2	1,3,5,6,8	7,10
CE3	4,7,9,10,12	2,6,11
Sub-organization enablers		
OE1	13	1,3,5,7,12
OE2	2,6,11	4,8
OE3	1,3,5,7,9,10,12	11
OE4	8	10
OE5	4	2,6,9,13
Sub-societal enablers		
SE1	2,5,9,11	3,6,7,10,13
SE2	1,3,8,10,12	2,4,9
SE3	4,6,7,13	1,5,8,11,12
Sub-environmental enablers		
EE1	3,4,7,10,13	1,5,8,12
EE2	6,9	2,3,7,10,11
EE3	1,2,5,8,11,12	4,6,9,13

Step 4: The decision maker compares the other criterion with the worst. Experts construct the "other-to-worst" vector using a 1 to 9 scale as discussed in step 3. This will also produce the vector $A_{Wj}= (a_{1W}, a_{2W}, \ldots, a_{nW})^T$, where a_{jW} denotes the relevance of the remaining criterion j in relation to the worst criterion W.

Step 5: The next step is to calculate the optimized weights (w_1^*, w_2^*, …, w_n^*) for each criterion.

In other words, from the obtained weights of each enabler j can be minimized for $\{|w_B - a_{Bj}w_j|,|w_j - a_{jw}w_w|\}$.The following min-max model will be determined as follows:

$$\min\ \max\ \{|w_B - a_{Bj}\,w_j|, |w_j - a_{jw}\,w_w|\}$$

$$s.t.\ \Sigma_j w_j = 1$$

$$w_j \geq 0, for\ \ all\ \ j \tag{1}$$

While Model (1) is converted into a linear model, the result has been improve, as present below.

min ξ^L

s.t.

$$|w_B - a_{Bj}w_j| \leq \xi^L, for\ \ all\ \ j$$

$$|w_j - a_{jw}w_w| \leq \xi^L, for\ \ all\ \ j$$

$$\Sigma_j w_j = 1; w_j \geq 0, for\ \ all\ \ j \tag{2}$$

Model (2) can be solved to get "optimal weights" (w_1^*, w_2^*, …, w_n^*) and "optimal value" ξ^L. The consistency (ξ^L) of value of the pairwise comparison required near 0 (Rezaei, 2016).

3.2. Interpretive structural modelling (ISM)

In complex decision-making research, ISM is used to create inter-dependent relationships among different enablers involved in building the aim of the study. Several research has adopted "ISM" in explaining various study instances relating to "supply chain complexity drivers," "understanding of the mutual relationship among the several sustainable manufacturing factors," and also for enabler identification (Kavilal et al., 2018; Tarei et al., 2021; Thirupathi and Vinodh, 2016). However, there are several MCDM methods', such as "Decision Making Test and Assessment Laboratory (DEMATEL)," "Analytic Hierarchy Process," and "Fuzzy Cognitive Mapping (FCM)," to examine the interrelation between "decision criteria". ISM surpasses the aforementioned strategies by breaking down a complex system into several sub-systems and then building a multilayer structural model. Here, multi-layer inter-relationship among each identified GEEs is obtained from the "driving power" as well as "dependence power" as from ISM and "fuzzy MICMAC analysis". Furthermore, Fuzzy MICMAC analysis broadens its usefulness by showing enablers in a cluster form (Cherrafi et al., 2017).

4. Illustrative application of the proposed methodology in manufacturing MSMEs

In the absence of a framework for assessing the enablers of sustainability, this study proposed a framework by integrating the concept of green entrepreneurship into CE and sustainable development. As no prior study is available in assessing the enablers of green entrepreneurship on CE, a mix-methodology (i.e., qualitative and quantitative methodology) was required to accomplish the same. To find the applicability and generalisation of this study, we considered expert opinions from all domains of the MSME manufacturing sector. Here MSMEs were considered because it has a huge contribution to any country's "Gross Domestic Product" (GDP) and employment creation (Tambunan, 2019). For data collection, Indian MSMEs manufacturing sectors were considered because India is an emerging developing country and has a significant contribution to the world economy (Khurana et al., 2021; Uttam et al., 2022). In addition, MSMEs in India and throughout the world have significant contributions to economic development; with this, they are more responsible for the emission of the maximum amount of CO_2, which has adverse effects on the environment (Manigandan et al., 2022). It is expected that green entrepreneurship with CE practices in India may minimize waste, enhance cleaner production, helps in employment creation and promote more business opportunities (Alonso-Almeida et al., 2021). Therefore, in recent climate change and environmental pollution problems, Governments and policyholders throughout the world, and also in India, are seeking to develop green practices for sustainable development (Khan et al., 2021). They have also tried to identify essential enablers that help businesses and entrepreneurs intended for CE development. For this, the study requires selective experts with profound knowledge and expertise in green, CE, and sustainability-related activities in manufacturing organizations. Despite a lot of efforts, there is a limited number of experts available. Moreover, only thirteen such experts who fulfilled the required criteria according to the research objectives were identified. Therefore, for enabler identification, we go ahead with these thirteen experts. All the experts considered here have an in-depth understanding and enough knowledge of green, CE and sustainable activities.

4.1. Experts' background and information

This study used a mixed methodology (qualitative and quantitative) method to evaluate enablers. The integrated methodology enhances the robustness of the developed framework. Further, this study used existing published literature reviews and experts' opinions to identify and finalize enablers of green entrepreneurship. The thirteen experts selected from different MSME manufacturing sectors have different levels of expertise. This study has considered thirteen experts, and by doing so, the accuracy of the enabler's identification has enhanced when compared to that of the previous studies (Gupta et al., 2020; Kusi--Sarpong et al., 2021; Moktadir et al., 2020) in which a minimum of ten experts have been considered. In addition, the diverse group of manufacturing organizations were purposefully chosen to ensure that the outcomes are more generalized for the manufacturing MSMEs and also in regard to other business aspects. For the expert selection, the inclusion criteria are as follows: they are from a manufacturing organization with a minimum of five years of work experience and must be involved in green entrepreneurship, CE or sustainability-related activity. Experts having experience in other fields rather than manufacturing (i.e., supply chain-related activity) were not considered. Experts who did not have enough experience and were not holding any kind of top management positions were also discarded. The industry experts taken into consideration were from the steel manufacturing industry electric component manufacturing industry, two senior members from manufacturing engineering goods, from the textile industry, food processing and from the automobile equipment manufacturing organizations, and the rest were all are from top technical and management firms. Most of the experts have a good amount of knowledge and experience in their relevant domain. Further, diverse manufacturing organizations were chosen for better generalizability of the results and to reduce the biasness of the study. The details of the thirteen experts are stated in Table 1.

This phase involved the identification and categorization of GEEs for CE and SD. Through an extensive "literature review", a total of sixteen enablers were identified. Based on multiple rounds of discussions with the industry experts, a total of seventeen enablers were identified. Two additional enablers were added, and two were discarded, and seventeen enablers were finalized. Finally, we consider these seventeen enablers throughout the study (Table A2 (Appendix A)).

5. Results

5.1. BWM result

After the finalization of the enablers, the experts were asked to rate the enablers on a scale of 1–9. The experts were initially asked to identify the "best" and "worst" enablers among the main and subcategory enablers. Then the most important and least important green entrepreneurial enablers were assigned as the "Best" criteria as well as the "Worst" criteria, as determined by each expert. In "pairwise comparison", the best GE enablers/sub-enablers are achieved with other GE enablers/sub-enablers of the "corresponding category" on a scale of 1–9. Here, 1 indicates "equal importance," and 9 indicates "extreme/intense importance," respectively. The expert rating was considered to derive the "Best-to-Others" (BO) matrix for GE enablers/sub-enablers. Similarly, to derive the "Others-to-Worst" (OW) matrix, the relative preference of other GE enablers/sub-enablers is then compared with the "Worst" GE enablers/sub-enablers on a scale of 1–9. Here also, the numeric value of 1 indicates "equal importance", and 9 indicates "extreme/intense importance," respectively, over other least preferred GE enablers/sub-enablers. To develop "BO" and "OW" matrix, all experts were again asked to rank the relative preference for each main category enabler (such as technical, commercial, organizational, environmental, and social) and associated sub-enabler separately. Table 2 shows the summary of the "best" as well as "worst" main and sub-enablers as the response by the experts (Table A2 (in Appendix A) shows details discussions of enablers).

For example, Table 3 presents the rating on the relative preference of the main GEEs given by Expert 1. In Table 3, Expert 1 chooses the technical factor as the best criterion, whereas the environmental factor is chosen as the worst criterion for pairwise comparison. The detailed pairwise comparison of sub-enablers, i.e., commercial, organizational, environmental, technical, and societal, are shown in Table A3 to A7 (Appendix A).

The category-wise "local weights" (LW) of each main/sub-enabler are obtained by optimal weights based on expert preference scores individually. Following that, the final LW of GE enablers and sub-enablers are determined by averaging the LW obtained from the preference score of individual experts (Table 4). "Local rankings" are assigned to each category of enablers and sub-enablers based on the average numeric local weight obtained (Fig. 5). Likewise, "Global weights" (GW) of GE sub-enablers are calculated by multiplying the corresponding main category GE enabler weight by the corresponding sub-enabler weights, as shown in (Table 4). GEEs sub-enablers are assigned global ranks based on their respective global weights. Starting with the sub-enabler with the most GW assigned as global rank 1, the next obtained weight by GEEs sub-enabler assigned rank two and continued till the other 15 enablers. The "GW" and the ranking of each "sub-enabler" are graphically presented in Fig. 6 (Table 4).

5.2. ISM result

After identifying and prioritizing the identified GEEs, an ISM-Fuzzy MICMAC approach has been implemented to classify the GEEs and present a stage-based conceptual model to demonstrate the contextual relationship among them. As this study is qualitative research and uses expert-based and decision-making methods, the ISM methodology is suitable for developing the relationship among GEEs (Jafari-Sadeghi et al., 2021). The details steps of the ISM methodology are discussed below.

Table 3
Main green entrepreneurial enablers comparison by expert rating.

Best-to-others (BO)	TE	CE	OE	SE	EE
Best enablers: Technology enablers	1	5	3	5	8
Other-to-Worst (OW)	Worst Enablers: Environmental enablers				
TE	8				
CE	3				
OE	6				
SE	3				
EE	1				

Table 4
Local weight and global weight.

Main enablers	Group Wt.	Sub-enabler (Code)	Local Wt.	Global Wt.	Rank
Technology-based enablers (TE)	0.228	Effective technological infrastructure facility (TE1)	0.419	0.096	1
		R&D and innovation capability (TE2)	0.315	0.072	5
		Development and acquisition of cleaner production technology (TE3)	0.266	0.061	7
Commercial-based enablers (CE)	0.231	Availability of capital to carry out innovative initiatives (CE1)	0.258	0.060	8
		Clear visibility of economic benefit (CE2)	0.392	0.091	2
		Reward, recognition, and financial support system (CE3)	0.351	0.081	4
Organization-based enablers (OE)	0.251	Strategic planning (OE1)	0.131	0.033	15
		Entrepreneurial simplicity, flexibility, and cooperation (OE2)	0.224	0.056	9
		Circular supply chain management (OE3)	0.356	0.089	3
		Corporate social responsibility and business ethics (OE4)	0.162	0.041	13
		Organizational performance assessment of waste management (OE5)	0.127	0.032	16
Societal-based enablers (SE)	0.178	Social norm and culture (SE1)	0.310	0.055	11
		Knowledge of waste management system (SE2)	0.374	0.066	6
		An attitude of acceptance of new technology (SE3)	0.316	0.056	10
Environmental-based enablers (EE)	0.111	Hazard and solid waste management (EE1)	0.360	0.040	14
		Inter and intra-organization collaboration (EE2)	0.224	0.025	17
		Environmental regulation and waste management policies (EE3)	0.415	0.046	12

5.2.1. Structural self-interaction matrix (SSIM)

The first stage of ISM methodology evaluates the relationship between every two GEEs in a pair. Here total number of pairwise comparisons is calculated by n_{C_2} Or {n*(n-1)}/2 (here n = number of GEEs) (Jafari-Sadeghi et al., 2021). The pair-wise comparison questions were designed to establish the contextual relationships between the essential GEEs. The same experts (as mentioned in Table 1) again asked to reply "yes" or "no" to the relationships of every enabler. Furthermore, the associations between the components are then examined and converted to SSIM using VAXO (the relationship of VAXO is provided below). The associated path between the enablers (i and j) was denoted by four symbols ("VAXO") (Darbari et al., 2018). Where "i" denotes the enabler in rows and "j" denotes the enabler in columns. Based on the expert responses, SSIM is generated by appropriately substituting "V, A, X, and O" to represent the interrelationship, as depicted in Table 5.

V: "where enabler i affect enabler j."
A: "where enabler i is affected by enabler j."
X: "where enabler i and j affect each other."
O: "where enabler i and j have no relationship."

5.2.2. Developing initial reachability matrix (IRM)

The Reachability Matrix (RM) is developed in two stages: the first development of the initial reachability matrix (Table 7), and the second is the final reachability matrix obtained from the IRM (Table 8). The initial reachability is obtained from the SSIM by converting "V, A, X, and O" to '0′ and '1′ as explained in Tables 6 and 7. In this stage, the validity of the expert's response is checked and also checked possible consistencies.

5.2.3. Developing final reachability matrix (FRM)

The IRM (Table 7) is obtained by replacing the value of "V, A, X, and O" in accordance with the substitution method in Table 6 into Table 5. The final reachability matrix (FRM) is presented in Table 8 after applying the transitivity rule. For rule of transitivity is described as "if enabler (a) is related to enabler (b) and enabler (b) is related to enabler (c), then enabler (a) is logically related to enabler (c)". When getting feedback from the experts, in most cases, the rule is not considered by the experts, and then a transitivity relationship occurs (Jafari-Sadeghi et al., 2021). The transitive elements are represented by the *marked cells in Table 8, where the values are altered from "0" to "1" in accordance with the "transitivity" rule (Jafari-Sadeghi et al., 2021).

5.2.4. Level partitioning

In this stage, level partitioning helps in the development of the hierarchical structure of GEEs. Here, the "final reachability matrix" helps in deriving the reachability as well as antecedent sets of each enabler. The antecedent set comprises of the element itself as well as any additional enabler that may assist in its completion, and the intersection between these two sets is achieved for all enablers. During the initial phase, the component of the "reachability set" as well as "intersection sets" are equivalent and are assigned as level I. After assigning level-I to the top-level enablers, it is excluded from the list of sustainable enablers. This process is continued until each component has attained its level. Here, the entire seven-level partitioning is done as shown in Table 9, and the detailed level partitioning is provided in Table A8 to Table A14 (Appendix A).

5.2.5. Formation of ISM diagram

Interpretive structural modelling (ISM) shows the interdependence of GEE sub-enablers at various levels, exhibiting the hierarchical seven-level structure of GEE sub-enablers shown in Fig. 7. For building the structural model, the reciprocal interaction among the GEE sub-enablers (Fig. 7) is obtained from the FRM (Table 8) and connected with directed lines (Table 9). Here unidirectional arrow pointing from node "X" to node "Y" indicates that "X" goes to "Y". A bidirectional line connecting the nodes "X" and "Y" represents "X" and "Y" mutually leading to each other and emphasizes the presence of reciprocal interactions between "X" and "Y". Fig. 7 depicts an ISM of specified GEE sub-enablers.

5.2.6. Fuzzy MICMAC analysis

MICMAC analysis has some benefits over other techniques in that it helps analyse the breadth of each element while considering the strength of the interactions between the elements (Bhosale and Kant, 2016). MICMAC analysis is generally used to develop a graphical presentation of enablers based on their driving as well as dependence power obtained from the final reachability matrix. In fuzzy MICMAC, the Fuzzy theory is applied to the traditional MICMAC. It has more advantages over conventional MICMAC, and it increases sensitivity between GEEs as per the importance of each other (Patel et al., 2021). For this study, fuzzy MICMAC analysis was used to cluster enablers based on their "driving" and "dependence power". From the fuzzy MICMAC stabilized matrix

Table 5
Structural self-interaction matrix (SSIM).

	EE3	EE2	EE1	SE3	SE2	SE1	OE5	OE4	OE3	OE2	OE1	CE3	CE2	CE1	TE3	TE2	TE1
TE1	V	X	V	V	X	V	V	X	V	V	V	V	V	V	V	V	
TE2	V	A	X	V	A	V	V	A	V	X	V	V	V	A	X		
TE3	V	A	X	V	A	V	V	A	V	X	V	V	V	A			
CE1	V	A	V	V	A	V	V	A	V	V	V	V	V				
CE2	X	A	A	V	A	X	A	A	V	A	A	X					
CE3	X	A	A	V	A	X	A	A	V	A	A						
OE1	V	A	A	V	A	V	X	A	V	A							
OE2	V	A	A	V	A	V	V	A	V								
OE3	A	A	A	A	A	A	A	A									
OE4	V	X	V	V	X	V	V										
OE5	V	A	A	V	A	V											
SE1	X	A	A	V	A												
SE2	V	X	V	V													
SE3	A	A	A														
EE1	V	A															
EE2	V																
EE3																	

Table 6
Explanation of symbol.

SSIM value	Binary replacement	
(i,j)th entry	(i,j)th entry	(j,i)th entry
V	1	0
A	0	1
X	1	1
O	0	0

adding all the numerical values along the row, we get "driving power"; by adding all the numerical values in the column, we get "dependence power". The step of the fuzzy MICMAC analysis is discussed below.

5.2.6.1. Binary direct relationship matrix. First, a "binary direct relationship matrix" (BDRM) is obtained by examining the direct relationships among the GEEs in the interpretive structural model (as presented in Table 7) by considering the diagonal element zero (Table 10).

5.2.6.2. Development of fuzzy direct relationship matrix (FDRM). Fuzzy MICMAC analysis incorporates fuzzy set theory because it enhances sensitivity, giving it an edge over traditional MICMAC. Again experts (Table 1) again ask to rerate the relationship of GEEs on a linguistic scale ranging between 0 and 1, as shown in Table 11 (Patel et al., 2021). For getting a fuzzy direct relationship matrix, suggested values are superimposed into a binary direct reachability matrix with transitivity (as presented in Table 12).

5.2.6.3. Fuzzy MICMAC stabilized matrix (FMSM). For deriving FMSM through a fuzzy matrix multiplication process (Table 13), the matrix is repeatedly multiplied until the driving and dependence power hierarchies are stabilized. In this case, the matrix multiplication procedure follows the Fuzzy matrix multiplication process as shown below.

$Z = X,\ Y = \max k\ \{\min (x_{ij}, y_{kj})\}$, Where, $X = \{x_{ik}\}$, and $Y = \{y_{kj}\}$

The GEEs are categorized based on their obtained "driving power" and "dependence power" (Table 14) through "fuzzy MICMAC analysis". The GE sub-enablers dependence power is plotted on the X-axis, whereas the obtained driving power of each sub-enabler is plotted on the Y-axis. Hence, from the plotting, we obtain a cluster of the sub-enablers based on their dependence and driving power coordinates, as presented in Fig. 8.

6. Discussion

The research focuses on introducing and identifying the critical enablers of green entrepreneurship that help a business in CE and sustainable development. Specifically, we studied important enablers of green business and its relationship with CE and sustainable development. A combination of literature, management theories (DCT, ST, and CSFT), and expert opinion were used to identify influencing enablers. To arrive at the results, a hybrid two-phased MCDM technique (BWM-ISM) was used here. The Best-Worst Approach (BWM) is used to evaluate green entrepreneurial main and associated sub-enablers, and the ISM method is utilized to construct a contextual relationship among the GEE

Table 7
Initial reachability matrix.

Enablers	TE1	TE2	TE3	CE1	CE2	CE3	OE1	OE2	OE3	OE4	OE5	SE1	SE2	SE3	EE1	EE2	EE3
TE1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TE2	0	0	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
TE3	0	1	0	0	1	1	1	1	1	0	1	1	0	1	1	0	1
CE1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
CE2	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	1
CE3	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1
OE1	0	0	0	0	1	1	0	0	1	0	1	1	0	1	0	0	1
OE2	0	1	1	0	1	1	1	0	1	0	1	1	0	1	0	0	1
OE3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OE4	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
OE5	0	0	0	0	1	1	1	0	1	0	0	1	0	1	0	0	1
SE1	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	1
SE2	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
SE3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
EE1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	1
EE2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
EE3	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	0

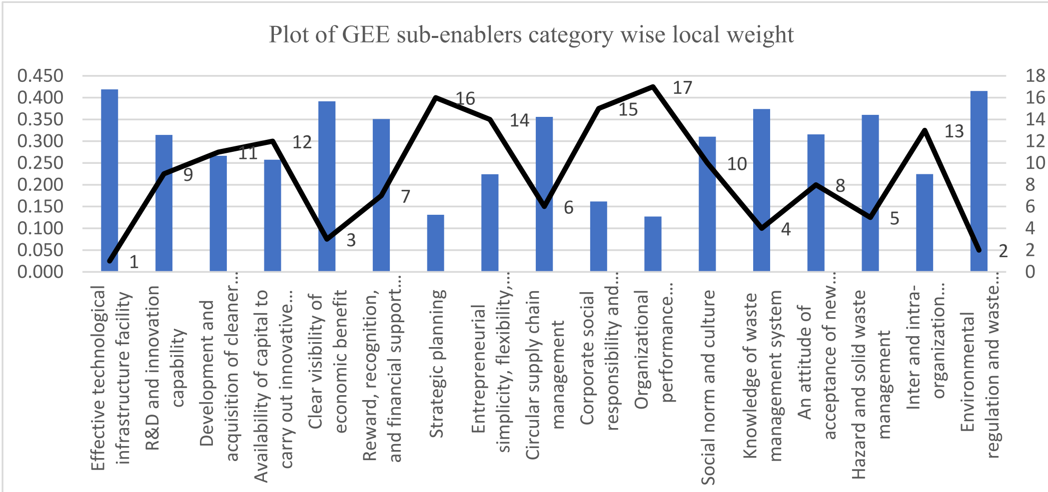

Fig. 5. Plot of GEE sub-enablers category-wise local weight (LW).

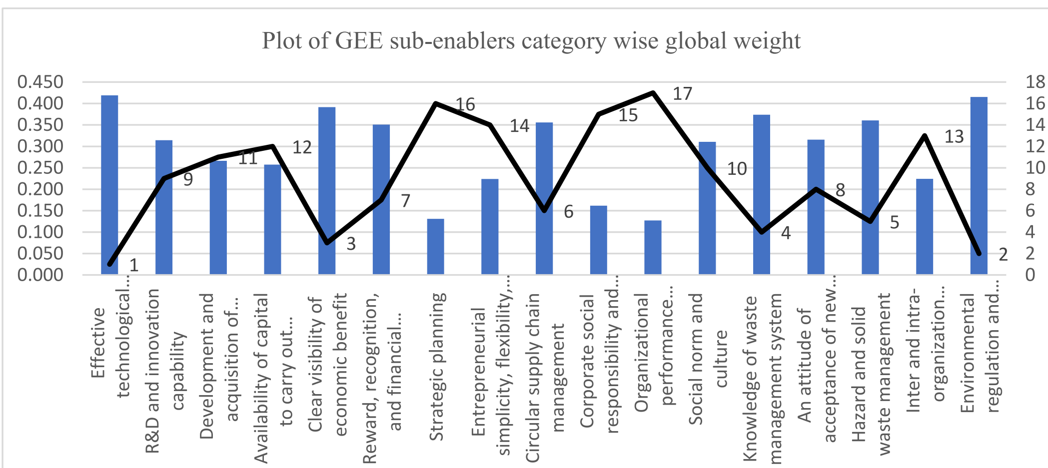

Fig. 6. Plot of GEE sub-enablers category-wise Global weight (GW).

Table 8
Final reachability matrix (FRM).

Enablers	TE1	TE2	TE3	CE1	CE2	CE3	OE1	OE2	OE3	OE4	OE5	SE1	SE2	SE3	EE1	EE2	EE3
TE1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TE2	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
TE3	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
CE1	0	1	1	1	1	1	1	1	1	0	1	1	0	1	1	0	1
CE2	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	1
CE3	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	1
OE1	0	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	1
OE2	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1*	0	1
OE3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
OE4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OE5	0	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	1
SE1	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	1
SE2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SE3	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
EE1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
EE2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
EE3	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	1

sub-enablers. Table 4 (Figs. 5 and 6) shows the "local" and "global weights" of the main and sub-category enablers, along with the ranking associated with their sub-enablers. The findings of this study were also discussed with the top management of the manufacturing industry and "decision-makers" to assist them in successfully implementing green practices to develop waste management and the development of a circular and "sustainable business environment".

Table 9
Level partitioning of green entrepreneurship sub-enablers.

Green entrepreneurship sub enablers	Driving power	Dependence power	Level of partitioning
TE1	17	4	I
TE2	12	9	III
TE3	12	9	III
CE1	13	5	II
CE2	6	15	V
CE3	6	15	V
OE1	8	11	IV
OE2	12	9	III
OE3	1	17	VII
OE4	17	4	I
OE5	8	11	IV
SE1	6	15	V
SE2	17	4	I
SE3	2	16	VI
EE1	12	9	III
EE2	17	4	I
EE3	6	15	V

6.1. Discussion of BWM results

Based on the findings of this study, the organizational-based enabler is ranked first (see Table 4) and is the essential enabler that encourages businesses to do a sustainability-related activity. This factor is important for manufacturing MSMEs because it considers strategic factors, team and administrative support, communication, and employee coordination (Khurana et al., 2021). This factor also helps an organization develop green and solid waste management practices, new technological capabilities, and CE development (Gupta et al., 2020; Sarja et al., 2021). This recommends that prominence should be provided to this enabler while making strategic planning in the business. These findings are also supported by other studies. For example, Hussain and Malik (2020) shows that organizational enablers are the most crucial drivers for encouraging green practices and transforming the linear economy to CE in a manufacturing business. Another study by Moktadir et al. (2018) suggests that some organizational factors (i.e., top management commitment, regulation and policies) are the prevailing diving enablers for conducting a sustainability-related activity. The "commercial-based enablers" (CE) received the second position through BWM analysis. It is another important main enabler of green entrepreneurship for CE development. The literature shows that commercial-based enablers may help to attain a "sustainable business environment" and develop infrastructure for waste minimization (Joensuu et al., 2020). Ali et al. (2019) showed that commercial-based enablers are mainly economic-focused and help businesses to develop sustainable related activities. Mishra et al. (2022) emphasize that a lack of commercial enablers creates an effective barrier to sustainability-related activities in manufacturing MSMEs. The economic activities help firms develop and enable more funds for the development of GE and CE, which is to minimize environmental degradation and develop sustainability. Next, "technology-related enablers" received the third position in "BWM analysis". The technological factor in a manufacturing business is a crucial enabler for the present business environment in India. India and other developing countries adopting green entrepreneurship and developing CE for sustainability remain challenging (Park et al., 2010; Hussain and Malik, 2020). Technology-based enablers of green entrepreneurship may drive CE and sustainability-related activity (Hussain and Malik, 2020; Shojaei

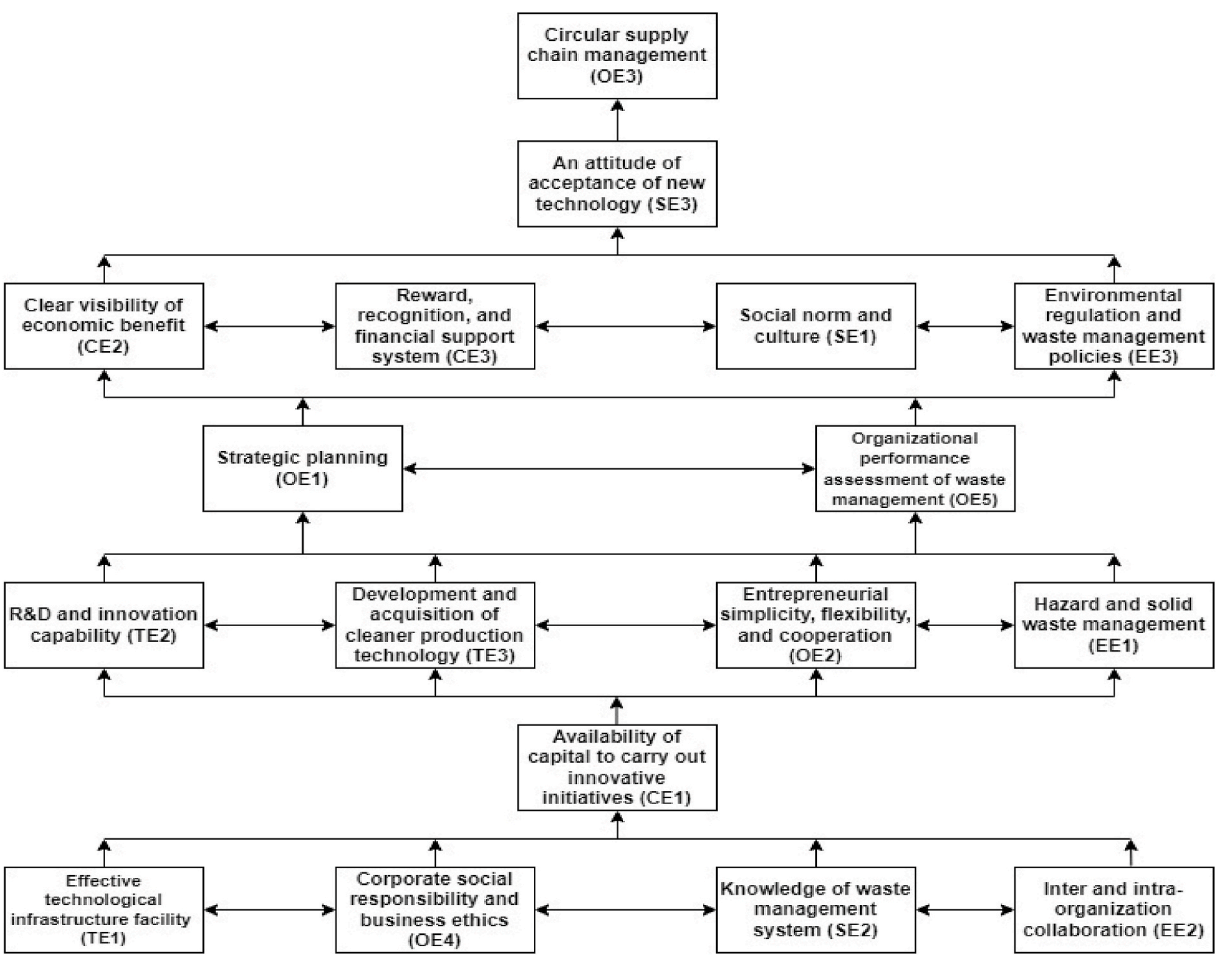

Fig. 7. Development of ISM model.

Table 10
Binary Direct reachability matrix.

GEE	TE1	TE2	TE3	CE1	CE2	CE3	OE1	OE2	OE3	OE4	OE5	SE1	SE2	SE3	EE1	EE2	EE3
TE1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TE2	0	0	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
TE3	0	1	0	0	1	1	1	1	1	0	1	1	0	1	1	0	1
CE1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	1	0	1
CE2	0	0	0	0	0	1	0	0	1	0	0	1	0	1	0	0	1
CE3	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	1
OE1	0	0	0	0	1	1	0	0	1	0	1	1	0	1	0	0	1
OE2	0	1	1	0	1	1	1	0	1	0	1	1	0	1	0	0	1
OE3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OE4	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1
OE5	0	0	0	0	1	1	1	0	1	0	0	1	0	1	0	0	1
SE1	0	0	0	0	1	1	0	0	1	0	0	0	0	1	0	0	1
SE2	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
SE3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
EE1	0	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	1
EE2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
EE3	0	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	0

Table 11
Possibility of the numerical value of the reachability.

Possibility of reachability	No	Very Low	Low	Medium	High	Very High	Complete
Values	0	0.1	0.3	0.5	0.7	0.9	1

et al., 2021). Some study shows (Bag et al., 2020; Patel et al., 2021) this enabler assists an organization in effective CE infrastructure facility development, research and development, and also the acquisition of new technology. "Social enabler" towards GE obtained the fourth rank in the "BWM analysis" (see Table 4). The "social enablers," one of the pillars of sustainability, contributes to the CE and sustainable development. These GEEs are important because this pillar motivates businesses to do business for society with profit generation (Lin et al., 2019).

Table 12
Fuzzy direct reachability matrix.

Enablers	TE1	TE2	TE3	CE1	CE2	CE3	OE1	OE2	OE3	OE4	OE5	SE1	SE2	SE3	EE1	EE2	EE3
TE1	0	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.7	0.7	0.9	0.9	0.7	0.7	0.9	0.9	0.9
TE2	0	0	0.7	0	0.7	0.7	0.9	0.7	0.5	0	0.7	0.7	0	0.5	0.9	0	0.9
TE3	0	0.9	0	0	0.7	0.9	0.5	0.7	0.5	0	0.9	0.5	0	0.7	0.7	0	0.7
CE1	0	0.9	0.9	0	0.7	0.9	0.7	0.9	0.5	0	0.9	0.7	0	0.5	0.7	0	0.7
CE2	0	0	0	0	0	0.9	0	0	0.7	0	0	0.7	0	0.5	0	0	0.9
CE3	0	0	0	0	0.5	0	0	0	0.9	0	0	0.5	0	0.9	0	0	0.9
OE1	0	0	0	0	0.9	0.9	0	0	0.7	0	0.7	0.9	0	0.9	0	0	0.5
OE2	0	0.9	0.5	0	0.7	0.9	0.9	0	0.7	0	0.7	0.5	0	0.9	0	0	0.5
OE3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OE4	0.5	0.7	0.9	0.9	0.5	0.5	0.9	0.7	0.9	0	0.7	0.9	0.5	0.5	0.9	0.7	0.9
OE5	0	0	0	0	0.7	0.5	0.7	0	0.9	0	0	0.5	0	0.9	0	0	0.9
SE1	0	0	0	0	0.5	0.7	0	0	0.7	0	0	0	0	0.7	0	0	0.7
SE2	0.7	0.9	0.7	0.5	0.7	0.9	0.7	0.5	0.7	0.9	0.9	0.7	0	0.5	0.7	0.9	0.9
SE3	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0
EE1	0	0.9	0.9	0	0.9	0.9	0.9	0.7	0.5	0	0.5	0.7	0	0.7	0	0	0.7
EE2	0.9	0.7	0.9	0.7	0.9	0.9	0.9	0.5	0.7	0.7	0.7	0.9	0.9	0.7	0.9	0	0.7
EE3	0	0	0	0	0.7	0.7	0	0	0.9	0	0	0.5	0	0.7	0	0	0

Table 13
Fuzzy MICMAC stabilized matrix (FMSM).

Enablers	TE1	TE2	TE3	CE1	CE2	CE3	OE1	OE2	OE3	OE4	OE5	SE1	SE2	SE3	EE1	EE2	EE3
TE1	0.9	0.9	0.9	0.7	0.9	0.9	0.9	0.7	0.7	0.7	0.9	0.9	0.9	0.9	0.9	0.7	0.9
TE2	0	0	0	0	0	0.9	0	0	0.7	0	0	0.7	0	0.5	0	0	0.9
TE3	0	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.9	0.7	0.9	0.9	0.7	0.9	0.9	0.9	0.9
CE1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.7	0.9	0.9	0.9	0.9	0.9	0.7	0.9
CE2	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.9	0.7	0.7	0.7	0.7	0.9	0.7	0.7	0.9
CE3	0.7	0.9	0.7	0.7	0.7	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.9	0.9	0.7	0.9
OE1	0	0.9	0.9	0	0.9	0.9	0.7	0.9	0.7	0	0.9	0.9	0	0.9	0.7	0	0.7
OE2	0.9	0.7	0.9	0.9	0.9	0.7	0.9	0.7	0.9	0.9	0.7	0.9	0.9	0.7	0.9	0.7	0.9
OE3	0	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.7	0.7	0.9	0.9	0.7	0.7	0.9	0.9	0.9
OE4	0.7	0.9	0.9	0.7	0.9	0.9	0.9	0.9	0.7	0.7	0.9	0.7	0.7	0.7	0.7	0.5	0.7
OE5	0.7	0.9	0.7	0.5	0.7	0.9	0.7	0.5	0.7	0.9	0.9	0.7	0	0.7	0.7	0.9	0.9
SE1	0	0	0	0	0.5	0.5	0	0	0.7	0.7	0	0.5	0	0.7	0	0	0.7
SE2	0.9	0.7	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.7	0.7	0.9	0.9	0.9	0.9	0.7	0.9
SE3	0	0	0	0	0	0.9	0	0	0.7	0	0	0.7	0	0.5	0	0	0.9
EE1	0	0.9	0.7	0	0.9	0.9	0.9	0.7	0.7	0	0.9	0.9	0	0.9	0.9	0	0.9
EE2	0.7	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.9	0.9	0.9	0.9
EE3	0	0	0.7	0	0.7	0.7	0.9	0.7	0.7	0	0.7	0.7	0	0.7	0.9	0	0.9

Table 14
Position coordinates of identified green entrepreneurial sub-enablers.

	Driving Power	Dependence Power
TE1	14.3	7.1
TE2	3.7	11.1
TE3	13.8	11.6
CE1	14.7	8.7
CE2	12.5	12.3
CE3	13.1	13.9
OE1	10	12
OE2	14.1	10.6
OE3	13.4	13.1
OE4	13.1	9
OE5	12	11.6
SE1	4.3	13.5
SE2	14.3	7.8
SE3	3.7	13.3
EE1	10.2	11.8
EE2	14.9	8.3
EE3	8.3	14.7

Therefore, this factor is the driving motivational GEEs for CE implementation. Lastly, among the main enabler, "environmental enablers" received the fifth position through BWM analysis. Environmental enablers are an important concern of green entrepreneurs for CE and sustainable development. It is an important aspect of entrepreneurs to motivate a circular business economy for sustainable development. This factor is important because it deals with global warming and climate change. Hence it motivates government to frame green policies and business stakeholders to consider this factor as most important concern (Dantas et al., 2021). Therefore, this is an imperative enabler for development of CE practice to achieve sustainability.

Among the sub-category enablers, the "effective technological infrastructure facility" (TE1) received the first position through BWM analysis (see Table 4) and is the most important GEEs for developing CE. Developing waste management infrastructure for CE development is very important (Moktadir et al., 2020). Manufacturing MSMEs often have fewer infrastructure facilities for CE development. For environmental and economic development, green entrepreneurs must develop proper infrastructure facilities for CE and SD (Isa et al., 2021; Kurniawan et al., 2021). Although these GEEs help reduce raw material, energy consumption and other environmental challenges, a study showed that an effective infrastructure facility could be the best technological tool for CE practices. Gupta et al. (2021) showed the importance of technological facilities in CE for waste management and achieving firm sustainability. These studies confirm that effective technology and infrastructure facility significantly assist green entrepreneurs and "decision-makers" in the accomplishment of CE and sustainable development in a manufacturing organization. "Clear visibility of economic benefit" (CE2) is an essential green entrepreneurial enabler that received the second position (see Table 4) among the sub-category enablers. Developing CE in an organization helps in reducing waste, recycling waste, reuse it as a resource. This helps to reduce material and resource consumption and create economic opportunity, along with developing a sustainable business framework (Gupta et al., 2021; Park et al., 2010). This factor motivates green entrepreneurs to develop a waste management system for CE and sustainable development (Rejeb et al., 2022; Suchek et al., 2021). The third most important sub-category of GEE is "circular supply chain management" (OE3). This GEE helps to manufacture MSMEs to reduce, recycle, and reuse waste for sustainable development (Centobelli et al., 2021). The integration of "circular supply chain management" in business helps to integrate circular factors (reusing, refurbishing, re-manufacturing, and recycling) with supply chain management (Farooque et al., 2019). This factor is important for manufacturing MSMEs to associate supply and demand, improve resource efficiency, and sustainable development. "Reward, recognition, and financial support system" (CE3) is an important GEE for the manufacturing industry that motivates entrepreneurs to use sustainable technologies for developing CE (Cantú et al., 2021). The financial support system from the Government and other institutions helps to develop infrastructure for CE. It received the fourth rank through BWM analysis (see Table 4). A strong financial support system significantly contributes circular system in manufacturing MSMEs (Singh et al., 2018). The "R&D and innovation capability" (TE2) is also another important GEEs for CE received fifth position through (BWM). Innovation, research and development helps developing new or renovating the ways which helps developing CE (Moktadir et al., 2020; Zahra et al., 2009). With this, GEE improve existing manufacturing processes, substantial improve productivity, besides creating environmental benefits and competitive advantage (Fernando et al., 2019). Ranta et al. (2018) investigated the importance of research and development for CE practices. The rest of the sub-enablers through BWM analysis ranked as follows TE1 > CE2 > OE3 > CE3 > TE2 > SE2 > TE3 > CE1 > OE2 > SE3 > SE1 > EE3 > OE4 > EE1 > OE1 > OE5 > EE2.

6.2. Discussion about ISM result

This study used the ISM technique for developing a contextual relationship among the GEEs that helps businesses for CE and sustainability through expert opinion. In the ISM model, a seven levelled

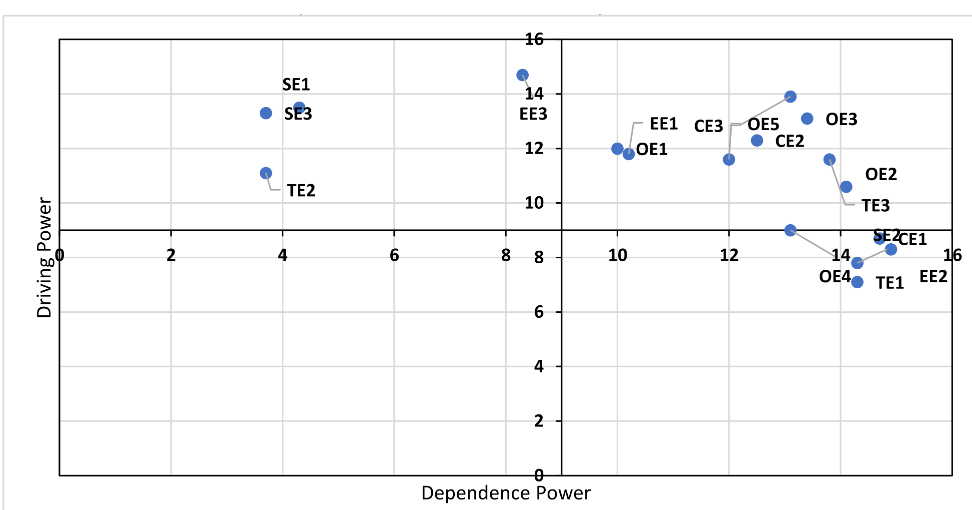

Fig. 8. Cluster performance by fuzzy MICMAC analysis.

hierarchical structure was established for the seventeen identified sub-GEEs. Further, the ISM technique revealed that the relationship exists among the identified enablers. Level 7 signifies the highest "driving power", and level one signifies the maximum "dependence power" among the sub-GEEs. The model of GEEs in Fig. 7 explains that effective technological infrastructure facility (TE1), corporate social responsibility and business ethics (OE4), knowledge of waste management (SE2), and inter and intra-organizational collaboration (EE2) is the stepping stone or essential critical enablers for CE development. As these factors have the highest driving power, it requires urgent attention from the decision-makers. In addition, sub-GEEs of level 7, namely TE1, OE4, SE2, and EE2, play an important role in driving the availability of capital to carry out innovative initiatives (CE1). This finding is also supported by the comment from industry experts from a top manufacturing business doing green practices and these findings from past studies (Azmat, 2013; Saha et al., 2018). Another noteworthy finding of our study shows that CE1 predominantly drives R&D and innovation capability (TE2), development and acquisition of cleaner production technology (TE3), entrepreneurial simplicity, flexibility and cooperation (OE2), and hazardous and solid waste management (EE1). This is also supported by experts and some past studies (Carfora et al., 2022; Entrialgo et al., 2000; Malav et al., 2020; Prashar, 2017). In this study, Mukherjee et al. (2021) show innovation initiatives help find an economical and eco-friendly way to hazardous and solid waste management in a business. Our results also explain that TE2, TE3, OE2, and EE1 help in strategic planning (OE1) and organizational performance assessment of waste management (OE5). Lack of proper strategic planning and improper assessment of waste management making barriers to entrepreneurs to CE development (Kharola et al., 2022). Further, OE1 and OE5 aid in clear visibility of economic benefit (CE2), reward recognition and financial support system (CE3), social norms and culture (SE1), and environmental regulation and waste management policies (EE3) for CE development. Moreover, CE2, CE3, SE1 and EE3 supports entrepreneurs or business' attitude toward the acceptance of new technology (SE3) (Esmaeilian et al., 2018). The SE3 further helps in the development of circular supply chain management (OE3) (Jia et al., 2020).

6.3. Discussion about fuzzy MICMAC analysis result

The Fuzzy MICMAC analysis is the indirect classification technique and helps in the comparative analysis of the relationships of each GEEs. In addition, this is the final step of ISM analysis and helps in clustering GEEs based on driving and dependence power (Ghobakhloo, 2020).

6.3.1. Categorization of GEEs

Further, the obtained result from fuzzy MICMAC analysis and according to driving and dependence power, GEEs are classified into four clusters (Fig. 8): "autonomous, driving, linkage, and dependent" GEEs. The detailed outcome of fuzzy MICMAC analysis is described below.

6.3.1.1. Cluster 1: autonomous GEE sub-enablers. Autonomous GEE possesses weak driving and dependence power. In our study, any enabler does not fall into this category of the cluster. In this cluster, GEEs are generally origin oriented as well as disconnected from the system and never affect CE and sustainable development (Patel et al., 2021). Hence in our study, all seventeen GEEs have significant contributions to CE and sustainable development.

6.3.1.2. Cluster 2: driving GEE sub-enablers. In this cluster, sub-enablers have weak dependence power and high driving power; hence, this cluster's enablers are considered independent variables. Six sub-enablers, i.e., 'social norm and culture' (SE1), 'an attitude towards acceptance of new technology (SE3), 'R&D innovation capability' (TE2), and 'environmental regulation and waste management policies' (EE3), belong to this group. These enablers are also called primary enablers; hence, they should be strategically more focused. Independent GEEs significantly impact other GEEs and govern the top of the ISM hierarchical model. As this factor is the base enabler, top management should develop strategies to develop these enablers for CE and SD. R&D and innovation capability are required for the development of a new way to manage waste and use it as a resource (Gupta and Barua, 2017). A lack of innovation activities often creates significant barriers to CE (Zhang et al., 2019). Compared to this, previous research like Gast et al. (2017) and Zhang et al. (2019) show that innovation, research and development are crucial for entrepreneurs to circular and sustainability-related activity. This factor is also important for developing strategic planning and new technology, which ultimately helps in circular supply chain management (de Sousa Jabbour et al., 2019). This attitude towards the acceptance of new technology among the employee helps in CE development. Khurana et al. (2021) show that it is an important factor in an organization developing sustainability-related activities. While social norms and culture help in developing policies for decision-makers considering social and economic benefits (Guzzo et al., 2022). Arranz et al. (2022) show that social norm and culture helps entrepreneurs in CE development. Further, environmental regulation and waste management policies help to develop green and sustainability-related activities (Zhang et al., 2019). Fatimah et al. (2020) found that regulation and waste management policies force businesses to develop circular activities for better environmental benefits.

6.3.1.3. Cluster 3: linkage GEE sub-enablers. These sub-enablers demonstrate strong driving power and dependence power. These studies find 'hazardous solid waste management (EE1), 'strategic planning' (OE1), 'entrepreneurial simplicity, flexibility, and cooperation (OE2), 'circular supply chain management (OE3), 'reward, reorganization, and financial support system' (CE3), 'clear visibility of economic benefit' (CE2), 'organizational performance assessment of waste management (OE5), and development and acquisition of cleaner production technology (TE3) are in this cluster. These GEEs are unstable in nature and affect other enablers in an organization. Tseng et al. (2019) show solid waste management links knowledge with circular supply chain management. Another study by Donner et al. (2020) considers strategic planning helps entrepreneurs perform circular and sustainable activities. In addition, entrepreneurial simplicity and flexibility motivate CE development for economic and social sustainability (Cheema et al., 2020). Where clear visibility of economic benefit motivate entrepreneur to do sustainability activities (Schaltegger and Burritt, 2018). Organizational performance and assessment of waste management are important for making strategic decisions (Al-Mawali et al., 2018). Hence, organizational performance and assessment of waste management help in making strategic decisions for CE, which in turn will improve long-term social, economic and environmental conditions. Therefore, improvement of any of the linkage variables has a positive influence on CE and sustainability.

6.3.1.4. Cluster 4: dependent GEE sub-enablers. The sub-enablers in this cluster have strong dependence power and weak driving power (see Fig. 8). 'Strategic planning' (CE1), 'knowledge of waste management' (SE2), 'effective technological infrastructure' (TE1), 'Inter and Intra organizational collaboration' (EE2), 'corporate social responsibility and business ethics' (OE4) are falling in this cluster. All these enablers fall at the topmost of the developed hierarchy and are hence considered critical GEEs for manufacturing MSMEs. In addition, the strong dependency of GEEs indicates that this cluster's enablers depend on other cluster enablers and most effectively help in the CE development of a manufacturing firm. According to past studies (Sun and Sun, 2021), strategic planning depends on other factors and helps businesses develop policies. For example, policies for green and sustainability aid in developing more responsible production, consumption and waste management. Other strategic factors include developing effective technological infrastructure, organizational collaborations, CSR activities that help an entrepreneur and business to CE, and sustainable development (Suchek et al., 2022). Yet, "performance-oriented factors" are important in this context of waste management (Gokarn and Choudhary, 2021). Moreover, training and knowledge help businesses to develop green circular activities (Tu and Wu, 2021).

In this literature, all seventeen GEEs are categorized into "independent", "linkage", and "dependent" enablers. The associations among these enablers justify the "dynamic capability theory", "stakeholder theory", and "critical success factor theory". It also signifies that the driving factor can act as an external enabling factor that further impacts dependent enablers (or firm CE performance) through linkage-enabling factors. The above explanation indicates that enablers of green entrepreneurship that aid business in CE implementation for sustainable development still has some research gap. However, this study explores the gaps in the existing literature by trying to fill these gaps through an in-depth study of GEEs on CE.

7. Conclusion

In the present scenario, with global sustainability concerns, competitive pressure, and pressure from the government and stakeholders, businesses are forced to adopt green and circular economy practices. Addressing the growing global sustainable concern, entrepreneurs and manufacturing businesses try to develop sustainable strategies to manage them. As manufacturing MSMEs have significant contributions to the Indian and the global economy, they also have particular challenges. To deal with this issue, identifying enablers of green entrepreneurship is important, which helps businesses develop a circular economy and sustainability. In the present scenario, technological, commercial, organizational, environmental, and societal enablers need urgent attention from entrepreneurs, businesses, and policymakers. It is tough to implement all solutions at a time; therefore, it is desirable to prioritize the enablers. Hence, the study uses robust "multi-criteria decision-making" techniques for prioritizing and showing the contextual relationship of green entrepreneurial enablers. The enablers were identified based on literature, management theory, and experts from manufacturing MSMEs. In this study, seventeen enablers have been found through relevant past studies and expert opinions. Further, using expert opinion and management theories, enablers are categorized into technology-commercial-organizational-environmental-social contexts. Then BWM is used for weight calculation and ranking, and ISM is used for developing a structural model to uncover the potential relationship among GEEs. Fuzzy MICMAC is used to cluster them based on their dependence and driving power. A case study of Indian manufacturing MSMEs is used to support the proposed framework. This study identifies a list of important main/essential enablers as well as sub-enablers of green entrepreneurship that helps the business, circular economy, and sustainable development. Although this study further helps in three main fields of literature: green entrepreneurship, circular economy, and sustainable development. It expands earlier literature that only focuses on the barriers, and another study focuses only on circular economy enablers.

With this, the study shows the relationship of enablers of green entrepreneurship with the circular economy. The results show that technological infrastructure, clear visibility of economic benefits, and waste management are identified as essential enablers of green entrepreneurship. Our analysis reveals that green entrepreneurship not only develops a circular economy but also helps develop a new business model. Further, it also encourages the advancement of creative industry, which generates more economical, competitive advantages besides sustainable development.

8. Implications, limitations, and future scope of the study

8.1. Implications of the study

The research provides several managerial and theoretical implications for managers, businesses, administrators, policymakers, and entrepreneurs regarding circular economy development. The study's findings also affirm the importance of GEEs for sustainable development in business. The identified enablers in this research will help managers and administrators to understand the importance of making policies and decisions related to the circular economy, which further helps sustainable development. Thus, managers should focus on each enabler to deal with environmental issues, resource scarcity, and for sustainable development. This empirical analysis used literature reviews and expert opinions from different backgrounds to identify green entrepreneurship enablers concerning technological, commercial, organizational, social, and environmental factors that inhibit waste management and circular economy development. For example, at the administrative level, the government should adopt an appropriate strategy to develop waste management facilities for sustainable development. Government financial and non-financial assistance fosters waste management and encourages entrepreneurs to take the initiative in improving their efficiency, which benefits the circular economy. Hence, some study proposes that in a growing country like India, the creation of waste management infrastructure helps sustainable development (Shekdar, 2009). As India is moving towards becoming a global manufacturing hub but has not yet effectively and properly developed green practices due to some complexity. Therefore, proper regulatory policy, proper long-term responsibility, research and development, workforce development, and infrastructure development are all required for the circular economy. Managers should be motivated to implement such solutions on a priority basis for their organizations' future success in the circular economy and sustainable development. Although managing waste provides a better balance for using finite resources wisely in business.

Furthermore, policies and regulations for organizational waste management should be implemented rapidly and effectively. Rewards for managers and administrators who follow the laws and regulations, as well as incentives, should be provided to enhance their skills in the form of fees, taxes, and subsidies will result in more flexibility and responsiveness in promoting waste management. In this context, the government should play an active role in regulating laws and supporting policies. Thus, regulatory authorities' waste management laws place greater pressure on firms to improve their circular economy abilities, which would aid India and the world's sustainable growth. For example, due to industry pressure, firms enhance their recycled resources and capabilities, allowing them to pursue sustainable activities. Identifying and categorizing GEEs helps in improving the firm's dynamic capabilities and allows for greater coordination of waste management efforts while reducing resource-constrained risk and uncertainty. Policies also encourage efficient waste management activities, motivate cleaner production, help in reducing the demand for fresh resources, and enable environmental development. Furthermore, MSMEs and entrepreneurs should collaborate to establish a sustainable organization by permitting adequate waste management policy planning. They should be adaptable in terms of encouraging green entrepreneurship and providing further assistance in reducing waste. To manage GEEs at each level of the circular economy, a mix of policies and structures, as well as proper coordination and collaboration among stakeholders, are needed. Hence, the study helps policymakers, regulatory authorities, and entrepreneurs understand the importance of GEEs for building the importance of technology adoption and skill improvement training for reuse, recycling, and remanufacturing waste. Managers need to work with their employees and guide them to develop new capabilities or integrate them into a dynamic business environment to succeed in the market. This study ranked enablers for in-depth analysis of each strategy where an organization can get more benefits from circular economy implementation.

Several theoretical implications in the entrepreneurship, circular economy, and sustainability literature were derived from this study. The findings of this study fundamentally expand prior knowledge about enablers of green entrepreneurship in circular economy sustainability literature. Further, this study also provides valuable insight into the widely neglected factors or enablers, such as the development and acquisition of cleaner production, entrepreneurial flexibility, waste management, regulations, etc. In addition, previous literature has emphasized that the circular economy or "green entrepreneurship" individually is responsible for sustainable development. We contribute to this research field by identifying enablers of green entrepreneurship and integrating it with the circular economy and sustainable development. More specifically, this study contributes to the GEEs literature by integrating entrepreneurship, circular economy, and sustainable development in a single study, which is unique in entrepreneurial literature. This study also intends to highlight how integrating methodologies (i.e., BWM, ISM, and Fuzzy MICMAC) helps rank enablers to understand the structural and driver-dependent relationship among GEEs. Further, this study also shows how integrated methodology is important in prioritizing and categorizing the factors, along with their contextual relationship and hierarchical structural model. This study used qualitative feedback for a deeper understanding of the enablers and for developing a decision-making model to determine GEEs. As we go further, the study also helps to understand the importance of the GEEs dimensions that matter for sustainable development. This study incorporates empirical perspectives with theoretical perspectives, i.e., dynamic capability theory, critical success factor theory, and stakeholder theory. The findings also indicate that all of the enablers are interconnected, and enterprises should focus on causing enablers for future circular and sustainability activities within the organization. To the best of our knowledge, no past research was used to identify enablers of green entrepreneurship in relation to the circular economy and sustainable development. Additionally, this study once again proved that this theory is more suitable for automation and sustainability studies. Finally, the overall findings also show that effective technological, organizational, commercial, social, and environmental enablers motivate businesses to develop a circular economy, which could then be directed toward relevance that would aid in achieving the SDG.

8.2. Limitations and future recommendations

This study identifies green entrepreneurial enablers that help the circular economy and sustainable development. This study tries to cover all other important aspects of enabler identification; still, this study has some limitations. First, for enablers identification, the literature related to green entrepreneurship and the circular economy was considered, further considering expert opinion from micro, small and medium enterprises constitute another limitation. This study focuses on manufacturing MSMEs in India, which is constrained to the generalization of the study. Second, data were collected from the experts for ranking (using BWM) and developing a hierarchical model, and clustering of enablers. As the study's inputs are subjective and based on expert judgments, there is a possibility of biasness affecting the final outcome. However, the biasness can be lowered if we use a questionnaire as a data collection tool and use exploratory factor analysis to combine related sets of enablers into a super-set of enablers. Here, a limited number of businesses as well as experts, were used during the collection of data. Further, all seventeen enablers that were identified are categorized into four groups through Fuzzy MICMAC analysis, but the strength of their association is not properly measured in this study. Hence, another statistical tool (such as structural equation modelling or a causal relationship diagram) can be used to measure the relationship and validate the result. This study can also be explored by using several other MCDM approaches such as "Elimination and Choice Translating Reality" (ELECTRE), "preference ranking organization method for enrichment evaluation" (PROMETHEE), "decision making trial and evaluation laboratory" (DEMATEL), and rough set theory. Here, this method considered expert opinion using the MCDM process, which has some research limitations. ISM-based models are not statistically validated models. Further studies can use different statistical tools (i.e., SEM) for more analysis. To generalize the results, a cross-country study might be conducted. Finally, here green entrepreneurial enablers were only identified; future studies can identify other types of entrepreneurial enablers, such as digital entrepreneurial enablers, and study their effects on circular economy and sustainable development.

CRediT authorship contribution statement

Sourav Mondal: Conceptualization, Writing – review & editing, Data curation, Formal analysis, Writing – original draft. **Saumya Singh:** Writing – original draft, Writing – review & editing, Supervision. **Himanshu Gupta:** Conceptualization, Writing – original draft, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A

Table A1
Contribution of previous literature on green entrepreneurship, circular economy and sustainable development.

References	Findings	Country	Industry considered	Methodology
de Sadeleer et al. (2020)	"The research explored the environmental advantages of waste management techniques for home organic food waste: recycling using anaerobic digestion and incineration."	Norway	Household organic food waste	Material flow and life cycle analysis
Zhu et al. (2019)	"A circular approach can help achieve ecological, economic, as well as social goals together, and economic viability is essential to succeeding in circular operation. Entrepreneurship is key to building and growing a circular business."	China	Biogas firm	Qualitative research
Drago and Gatto (2022)	"There is a positive relationship between energy efficiency and entrepreneurs, and government strategies and support help a sustainable entrepreneurial ecosystem."	Global study	Secondary data	Monte-Carlo simulation
Nuringsih and Nuryasman (2022)	"The green entrepreneurial intention has a significant contribution to the perceived circular economy."	Jakarta	Education	Structural equation modeling (SEM)

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Table A1 (*continued*)

References	Findings	Country	Industry considered	Methodology
Moktadir et al. (2020)	"Lack of financial facilities poses a significant challenge for the successful implementation of circular economy practices."	Bangladesh	Leather industry	MCDM (BWM)
Le et al. (2022)	"Circular economy practices and entrepreneurship promote sustainable supply chain management and facilitate sustainable performance for small and medium-sized enterprises."	Southeast Asia, Vietnam	Food supply chain sector	SEM
Alonso-Almeida et al. (2020)	"A circular economy aids in sustainable development."	Europe	Public authority, civil society	SEM
Sharma et al. (2020)	"The environmental management system is the most significant driving enabler to a circular economy. Developing strict legislation, building a green image, and supporting the producers help implement circular economy practices."	India	Manufacturing Industry	MCDM
Lahane and Kant (2022)	"Government, management, and economic initiatives that mitigate waste and enhance environmental sustainability play a significant role in adopting circular economy practices."	India	Manufacturing industry	MCDM
Karimi and Nabavi Chashmi (2019)	"Green entrepreneurship mediates the effect of green innovation, organizational culture, competitive advantage, and company social and environmental responsibility on the company's financial performance."	Tehran	Small, medium enterprises	SEM
Soh and Wong (2021)	"Customer involvement, design capabilities, and sustainable competitive advantage significantly contribute to the circular economy."	Malaysia	Manufacturing industry	SEM
Moraga et al. (2019)	"This study identifies indicators and strategies for circular economy development."	European indicators		Qualitative research

Table A2
Main and sub-green entrepreneurial enablers

Variables	Sub variables	Description	References
Technology-based enablers (TE)	Effective technological infrastructure facility (TE1)	Effective technological infrastructure helps green entrepreneurs in managing, recycling, and reusing waste effectively such that resources may be used most effectively for circular economy and sustainable development.	Khan et al. (2021); Salvador et al. (2021)
	R&D and innovation capability (TE2)	R&D and innovation helps green entrepreneurs to design sustainable products, implement new ideas and thus inculcating green practices in the company and aids in providing fresh perspectives of circular economy on sustainability.	Khan et al. (2021); Li et al. (2019); Soh and Wong (2021)
	Development and acquisition of cleaner production technology (TE3)	Developing and acquiring cleaner production technology provides greener production benefits which include less waste, recovery of valuable byproducts, and improved environmental performance.	Lahane et al. (2022); Murray et al. (2017)
Commercial-based enablers (CE)	Availability of capital to carry out innovative initiatives (CE1)	Organizations should have enough capital so that green entrepreneurs can implement green technology and the technical know-how required for achieving circular economy and sustainability-related goals.	Lahane et al. (2022)
	Clear visibility of economic benefit (CE2)	The highly visible of economic benefits arising from waste recycling enables green entrepreneurs to strengthen the use of waste and make it an opportunity to satisfy market demands while meeting circular economic growth.	Genovese et al. (2017); Kuo and Chang (2021); Schaltegger and Burrit (2018)
	Reward, recognition, and financial support system (CE3)	Financial support, reward, and recognition from the government and public institutions motivate green entrepreneurs to manage waste effectively and develop sustainable technologies for circular economy and sustainable development.	Chen et al. (2020); Corona et al. (2019)
Organization-based enablers (OE)	Strategic planning (OE1)	Green entrepreneurs can do proper strategic planning to limit the use of materials that cause pollution and environmental degradation by redesigning things which consume fewer resources and using waste as a resource to develop new materials and goods for a CE, and thus SDG is achieved.	Barros et al. (2021); Chembessi et al. (2022)
	Entrepreneurial simplicity, flexibility, and cooperation (OE2)	Entrepreneurial flexibility, simplicity, and cooperation helps green entrepreneurs in managing waste, drive environmentally friendly operations, shifting business practices to achieve circular economy, and dealing with unanticipated problems when moving towards sustainable development goals.	Corona et al. (2019); Majumdar and Sinha (2018)
	Circular supply chain management (OE3)	Circular supply chain management incorporates environmentally friendly approaches into the conventional "supply chain" by increasing the usage of "recycled materials" in packing and shipment handling for sustainability.	Burke et al. (2021); Farooque et al. (2019); Habib et al. (2020); Majumdar and Sinha (2018); Ying & Li-jun (2012)
	Corporate social responsibility and business ethics (OE4)	Green entrepreneurs should develop ethical corporate social responsibility, sociocultural values, and ethics through practicing transparency, accountability, and sustainability in day-to-day business dealings for circular economy development.	Dwivedi et al. (2012); Mazzucchelli et al. (2022); Suchek et al. (2021)
	Organizational performance assessment of waste management (OE5)	Entrepreneurs should develop an organizational performance assessment that helps to assess existing waste management techniques, as well as to determine the categories and materials where waste reduction initiatives will be most successful while developing circular economy and sustainable development.	Ikram et al. (2020); Kazancoglu et al. (2018); Nikolaou et al. (2011)

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Table A2 (*continued*)

Variables	Sub variables	Description	References
Societal-based enablers (SE)	Social norm and culture (SE1)	Social and cultural norms are behavioral standards based on shared beliefs within an organizational setup. It assists green entrepreneurs in developing beliefs, culture, and attitudes within the organizational culture to make a transition from a "linear economy" to a CE for sustainable development.	Horne and Fichter (2022); Rovanto and Finne (2022)
	Knowledge of waste management system (SE2)	Developing waste management knowledge system of an organization helps to dispose, reduce, reuse, recycle, and prevent waste.	Fatimah et al. (2020); Sharma et al. (2021)
	An attitude of acceptance of new technology (SE3)	Positive attitude towards technology helps green entrepreneurs to introduce new technologies such as waste management technology for circular economy and sustainable development.	Coderoni and Perito (2020); Rizos et al. (2016)
Environmental-based enablers (EE)	Hazard and solid waste management (EE1)	Developing effective hazard and solid waste management system helps a green entrepreneur to collect, recycle, transport, monitor, and treat waste effectively for circular economy and sustainable development.	Loh et al. (2020); Sharma et al. (2021)
	Inter and intra-organization collaboration (EE2)	Adopting inter and intra-organizational collaboration for environmental management helps in sharing information and technology, which lead to producing green and sustainable products and thus boosting circular economy.	Amjad et al. (2022); Wu (2013); Yadav et al. (2019)
	Environmental regulation and waste management policies (EE3)	Designing effective policies and frameworks by government and policymakers helps a green entrepreneur to reduce environmental degradation and to develop proper waste management for a circular economy and sustainable development.	Chen et al. (2020); Dagilienė et al. (2021); Dong et al. (2021)

Table A3
Pairwise comparison for Technological sub-enablers

Best to other for 13 respondents'				
Experts	Best criterion	TE1	TE2	TE3
Expert1	TE1	1	4	9
Expert2	TE1	1	9	3
Expert3	TE2	9	1	4
Expert4	TE1	1	4	9
Expert5	TE3	3	9	1
Expert6	TE2	4	1	9
Expert7	TE1	1	9	3
Expert8	TE3	9	3	1
Expert9	TE1	1	4	9
Expert10	TE3	4	9	1
Expert11	TE2	3	1	9
Expert12	TE1	1	6	9
Expert13	TE2	9	1	3

Others to Worst for 13 respondents													
Experts	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10	Expert11	Expert12	Expert13
Worst criterion	TE3	TE2	TE1	TE3	TE2	TE3	TE2	TE1	TE3	TE2	TE3	TE3	TE1
TE1	9	9	1	9	5	4	9	1	9	4	5	9	1
TE2	4	1	9	4	1	9	1	5	3	1	9	3	9
TE3	1	5	3	1	9	1	5	9	1	9	1	1	4

Table A4
Pairwise comparison for Commercial sub-enablers

Best to other for 13 respondents'				
Experts	Best criterion	CE1	CE2	CE3
Expert1	CE2	9	1	3
Expert2	CE1	1	4	9
Expert3	CE2	9	1	4
Expert4	CE3	8	3	1
Expert5	CE2	9	1	5
Expert6	CE2	3	1	9
Expert7	CE3	4	9	1
Expert8	CE2	9	1	5
Expert9	CE3	8	2	1
Expert10	CE3	4	9	1
Expert11	CE1	1	4	9
Expert12	CE3	9	3	1
Expert13	CE1	1	8	5

Others to Worst for 13 respondents													
Experts	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10	Expert11	Expert12	Expert13
Worst criterion	CE1	CE3	CE1	CE1	CE1	CE3	CE2	CE1	CE1	CE2	CE3	CE1	CE2
CE1	1	9	1	1	1	5	4	1	1	3	9	1	9
CE2	9	4	9	5	9	9	1	9	6	1	4	5	1
CE3	5	1	3	9	4	1	9	3	9	9	1	9	2

Table A5
Pairwise comparison for Organization-based sub-enablers

Best to other for 13 respondents'						
Experts	Best criterion	OE1	OE2	OE3	OE4	OE5
Expert1	OE3	9	5	1	3	4
Expert2	OE2	5	1	3	5	9
Expert3	OE3	9	2	1	4	5
Expert4	OE5	5	9	3	6	1
Expert5	OE3	9	3	1	4	6
Expert6	OE2	4	1	2	5	9
Expert7	OE3	9	4	1	6	7
Expert8	OE4	5	9	4	1	6
Expert9	OE3	7	6	1	4	9
Expert10	OE3	3	5	1	8	4
Expert11	OE2	4	1	9	5	6
Expert12	OE3	9	4	1	3	4
Expert13	OE1	1	3	5	5	9

Others to Worst for 13 respondents													
Experts	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10	Expert11	Expert12	Expert13
Worst criterion	OE1	OE5	OE1	OE2	OE1	OE5	OE1	OE2	OE5	OE4	OE3	OE1	OE5
OE1	1	4	1	4	1	5	1	4	2	5	5	1	9
OE2	3	9	6	1	5	9	4	1	3	2	9	5	6
OE3	9	5	9	5	9	6	9	4	9	9	1	9	2
OE4	5	3	4	2	4	3	3	9	4	1	4	6	3
OE5	4	1	3	9	3	1	2	2	1	3	3	4	1

Table A6
Pairwise comparison for Societal sub-enablers

Best to other for 13 respondents'

Experts	Best criterion	SE1	SE2	SE3
Expert1	SE2	5	1	9
Expert2	SE1	1	9	4
Expert3	SE2	9	1	5
Expert4	SE3	4	9	1
Expert5	SE1	1	5	9
Expert6	SE3	9	5	1
Expert7	SE3	9	4	1
Expert8	SE2	3	1	9
Expert9	SE1	1	9	3
Expert10	SE2	9	1	4
Expert11	SE1	1	3	9
Expert12	SE2	4	1	9
Expert13	SE3	9	4	1

Others to Worst for 13 respondents

Experts	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10	Expert11	Expert12	Expert13
Worst criterion	SE3	SE2	SE1	SE2	SE3	SE1	SE1	SE3	SE2	SE1	SE3	SE3	SE1
SE1	3	9	1	3	9	1	1	5	9	1	9	4	1
SE2	9	1	9	1	3	3	4	9	1	9	5	9	4
SE3	1	3	3	9	1	8	9	1	5	4	1	1	9

Table A7
Pairwise comparison for Environmental sub-enablers

Best to other for 13 respondents'

Experts	Best criterion	EE1	EE2	EE3
Expert1	EE3	9	5	1
Expert2	EE3	3	9	1
Expert3	EE1	1	9	3
Expert4	EE1	1	5	9
Expert5	EE3	9	7	1
Expert6	EE2	5	1	9
Expert7	EE1	1	9	6
Expert8	EE3	9	5	1
Expert9	EE2	4	1	9
Expert10	EE1	1	9	4
Expert11	EE3	6	9	1
Expert12	EE3	9	4	1
Expert13	EE1	1	3	9

Others to Worst for 13 respondents

Experts	Expert1	Expert2	Expert3	Expert4	Expert5	Expert6	Expert7	Expert8	Expert9	Expert10	Expert11	Expert12	Expert13
Worst criterion	EE1	EE2	EE2	EE3	EE1	EE3	EE2	EE1	EE3	EE2	EE2	EE1	EE3
EE1	1	5	9	9	1	3	9	1	3	9	3	1	8
EE2	3	1	1	3	2	9	1	3	9	1	1	4	4
EE3	9	9	5	1	9	1	2	9	1	4	9	9	1

Table A8
Level partitioning for GEEs

Iteration level −1				
Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
TE2	TE2, TE3, CE2, CE3, OE1, OE2, OE3, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
TE3	TE2, TE3, CE2, CE3, OE1, OE2, OE3, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
CE1	TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE5, SE1, SE3, EE1, EE3	TE1, CE1, OE4, SE2, EE2	CE1	
CE2	CE2, CE3, OE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
CE3	CE2, CE3, OE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
OE1	CE2, CE3, OE1, OE3, OE5, SE1, SE3, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
OE2	TE2, TE3, CE2, CE3, OE1, OE2, OE3, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
OE3	**OE3**	**TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3**	**OE3**	**I**
OE4	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
OE5	CE2, CE3, OE1, OE3, OE5, SE1, SE3, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
SE1	CE2, CE3, OE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
SE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
SE3	OE3, SE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	SE3	
EE1	TE2, TE3, CE2, CE3, OE1, OE2, OE3, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
EE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE3, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE3	CE2, CE3, OE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	

Table A9
Iteration level −2

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
TE2	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
TE3	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
CE1	TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE5, SE1, SE3, EE1, EE3	TE1, CE1, OE4, SE2, EE2	CE1	
CE2	CE2, CE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
CE3	CE2, CE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
OE1	CE2, CE3, OE1, OE5, SE1, SE3, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
OE2	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
OE4	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
OE5	CE2, CE3, OE1, OE5, SE1, SE3, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
SE1	CE2, CE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	
SE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
SE3	SE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	SE3	II
EE1	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, SE3, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
EE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, SE3, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE3	CE2, CE3, SE1, SE3, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	

Table A10
Iteration level −3

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
TE2	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
TE3	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
CE1	TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE5, SE1, EE1, EE3	TE1, CE1, OE4, SE2, EE2	CE1	
CE2	CE2, CE3, SE1, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	III
CE3	CE2, CE3, SE1, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	III
OE1	CE2, CE3, OE1, OE5, SE1, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
OE2	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
OE4	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
OE5	CE2, CE3, OE1, OE5, SE1, EE3	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	
SE1	CE2, CE3, SE1, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	III
SE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE1	TE2, TE3, CE2, CE3, OE1, OE2, OE5, SE1, EE1, EE3	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
EE2	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE3	CE2, CE3, SE1, EE3	TE1, TE2, TE3, CE1, CE2, CE3, OE1, OE2, OE4, OE5, SE1, SE2, EE1, EE2, EE3	CE2, CE3, SE1, EE3	III

Table A11
Iteration level −4

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2,	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
TE2	TE2, TE3, OE1, OE2, OE5, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
TE3	TE2, TE3, OE1, OE2, OE5, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
CE1	TE2, TE3, CE1, OE1, OE2, OE5, EE1	TE1, CE1, OE4, SE2, EE2	CE1	
OE1	OE1, OE5	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	IV
OE2	TE2, TE3, OE1, OE2, OE5, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
OE4	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
OE5	OE1, OE5	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	OE1, OE5,	IV
SE2	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE1	TE2, TE3, OE1, OE2, OE5, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	
EE2	TE1, TE2, TE3, CE1, OE1, OE2, OE4, OE5, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	

Table A12
Iteration level −5

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2,	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
TE2	TE2, TE3, OE2, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	V
TE3	TE2, TE3, OE2, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	V
CE1	TE2, TE3, CE1, OE2, EE1	TE1, CE1, OE4, SE2, EE2	CE1	
OE2	TE2, TE3, OE2, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	V
OE4	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
SE2	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE1	TE2, TE3, OE2, EE1	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE2, TE3, OE2, EE1	V
EE2	TE1, TE2, TE3, CE1, OE2, OE4, SE2, EE1, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	

Table A13
Iteration level −6

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, CE1, OE4, SE2, EE2,	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
CE1	CE1	TE1, CE1, OE4, SE2, EE2	CE1	VI
OE4	TE1, CE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
SE2	TE1, CE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	
EE2	TE1, CE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	

Table A14
Iteration level −7

Variables	Reachability Set	Antecedent Set	Intersection	Level
TE1	TE1, OE4, SE2, EE2,	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	VII
OE4	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	VII
SE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	VII
EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	TE1, OE4, SE2, EE2	VII

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