INTEGRATING GREEN ORIENTATION, INNOVATION, AND SUSTAINABILITY: SYSTEMATIC REVIEW USING THE TCCM FRAMEWORK

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Highlight

The review offers comprehensive insights into GEO's role in driving green innovation and sustainability, while highlighting research gaps and future directions for academics and policymakers.

Abstract

Green Entrepreneurial Orientation (GEO) is emerging as a critical framework for fostering sustainability-driven innovation and leveraging entrepreneurial initiatives to address environmental challenges. Although substantial research has been conducted on GEO, a comprehensive and critical review of recent studies is still warranted. This review contributes to the existing literature by applying the Theory–Context–Characteristics–Methods (TCCM) framework, offering an integrated understanding of the theories, contexts (e.g., industries and countries), characteristics (i.e., antecedents, moderating/mediating variables, and outcomes), and methods (i.e., data analysis techniques) employed in GEO research between 2018 and 2024. The PRISMA methodology was used to systematically identify and evaluate relevant studies. The analysis also highlights leading authors, influential journals, contributing countries, and current trends in GEO scholarship. The findings provide valuable insights for researchers, practitioners, and policymakers, supporting more informed decision-making in the context of green entrepreneurship and sustainability.

Keywords

Green entrepreneurial orientation, green innovation, green entrepreneurship, sustainable performance, PRISMA, TCCM framework

Introduction

A great deal of environmental issues have gripped the world, ranging from reduction in biodiversity, exhaustion of natural resources, unprecedented rising population, carbon emission, climate change and increasing amount of waste generation from different operational activities (Tuncer et al. 2024). Meanwhile, society's increased awareness about the environment puts pressure on many countries to initiate a green transition and opportunities for a cleaner economy (Kotchen, 2009). As environmental concerns pose a growing threat to human welfare and economic prosperity, businesses believe in bringing in sustainable changes via their operations (Leonidou et al. 2017). Environmental sustainability has become a subject of focus in environmental legislation for the Government, academic professionals, as well as industrialists (Sreenivasan et al. 2023), and tries to fix up sustainable solutions for the same (Boons et al. 2013). Generally, sustainability is viewed as an organisation's all-inclusive strategy (Sreenivasan et al. 2023), as it encompasses preserving the environment, social and economic resources (Suresh et al. 2023). Jiang et al. (2018) rightly said that sustainability issues have become a worrying agenda way beyond social issues, wherein the business enterprises also have to think about environmental impact along with the profit maximisation goal of business enterprises (Tuncer et al. 2024).

Here comes the significance of green innovation or eco-innovation, which addresses environmental issues of business enterprises (Hummels et al. 2021) and gains economic prosperity (Fliaster et al. 2017). Green Innovation emerges to be a critical process of fostering a cleaner & greener global environment, in addition to technological advancements by integrating ESG governance; Aguilera et al. 2013; Arenhardt et al. 2016; Chen et al. 2012; Chen et al. 2016; Takalo, 2021). In response to growing global awareness on sustainability among consumers, policy-

makers, and the Government, demand for eco-friendly products and services gears up (Yung et al. 2011; Zhu et al. 2008; Takalo et al. 2021).

Given this reality, businesses are stressed to embrace green entrepreneurial orientation, a strategy which can assist organisations to adopt environmental actions and sustainable practices (Terán-Yépez et.al., 2020). GEO is seen as the propensity or tendency of an organisation to seize possible opportunities for economic gains with an environmental mindset by delivering eco-friendly products and services (Al-Swidi et al., 2023). It is rather regarded as a roadway to capture environmental innovation (Wang et al. 2023; Divito et al. 2021; Gilley et al. 2000; Schaltegger et al. 2011; Silva et al. 2021; Tiba et al. 2020). GEO can be defined as an organisation's preparedness and willingness to initiate innovative, proactive, and risky environmental actions for the betterment of their business in which they are operating (DiVito et al. 2017; Ameer & Khan, 2023). It is said that a business with strong GEO proactively identifies and capitalizes on the possible opportunities that support ecological sustainability (Halbusi et al. 2024). GEO can be a strategic resource and key antecedent for green innovation among entrepreneurs to innovate and offer eco-friendly products and services (Alshebami, 2023).

Over the years, scholars have come out with different opinions on green entrepreneurial approach (Muangmee et al. 2021), for instance, Arruda, M. C. (1999) refers green entrepreneurial orientation as a combination of entrepreneurial orientation with environmental initiative, while Cohen et al. (2007) suggests social orientation and environmental orientation adds to the crucial part of GEO and that Jiang et al. (2018) demonstrate GEO as a dynamic capability in decision making process of business operations.

Although prior studies have already offered insightful perspectives, for both academics and practitioners, to harmonise the body of knowledge on GEO, there still exists certain limitations to be addressed. The literature review by Golsefid-Alavi et al. (2021), covering the period from 1983 to 2020, had considered a semi-systematic and narrative approach to detail on internal and external factors affecting GEO. However, the study is limited to pinpointing only the factors affecting GEO rather than undertaking a broader and more systematic approach towards the concept of GEO. Another review study by Ameer & Khan (2023), covering the period of January 2000 to August 2021, delivered a detailed investigation on micro, meso and macro factors affecting GEO, and, also provided a detailed investigation on GEO and corporate performance relationship. However, the study limits to covering literature up to August 2021. Another study by Tuncer & Korchagina (2024) has considered this limitation and emphasized GEO directions by using Garrard's SLR Matrix in accordance with the PRISMA guide. The study manages to figure out solutions to certain limitations addressed in prior studies like to consider further literature reviews from 2014 to January 2024, considering more individual and environmental consequences of GEO (Tuncer & Korchagina 2024), and also to examine theories used in GEO literature. However, there still exists a limitation of addressing GEO till January 2024, which demands the need for more qualitative analysis of the effect of GEO on business enterprises from recent studies.

The current study, therefore, seeks to fill the gap in the literature on green entrepreneurial orientation, green innovation, and sustainability by incorporating limitations of previous studies as well as applying PRISMA and TCCM frameworks for a comprehensive view of GEO to date.

It answers the following questions:

1. What is the current status of knowledge about "green entrepreneurial orientation" in literature?'
2. 'What theories, contexts, characteristics, and methodologies have been used in' green entrepreneurial orientation?
3. 'What are the prospects for green entrepreneurial orientation research in the future?

This study has the following sections. After the introduction, "Section 2" emphasise on structure and methodology of the review, "Section 3" focus on publication agenda along with key theme, influential journals and authors in GEO study, "Section 4" covers theoretical background using TCCM approach, and "Section 5" contributes to results and discussions, managerial implications, limitations, and unique contribution of the study, followed by, conclusion and references.

2. STRUCTURE OF THE REVIEW AND METHODOLOGY

This section discusses research approach, research method using TCCM framework, Keyword and Database search strategies, and inclusion/exclusion criteria for the study.

2.1 Research Approach:

Paul et al. (2020) emphasize choosing unique topics in SLR research and offering fresh insights. This study consolidates Green Entrepreneurial Innovations literature using PRISMA methodology (Gaur & Kumar, 2018;

Tuncer et al., 2024) to ensure precision, clarity, and effectiveness, contributing new perspectives to the existing body of work.

2.2 TCCM Approach:

The current study applied TCCM framework which helps to present the most widely used theories (T), contexts (C), characteristics (C), and techniques (M) used in the study topic (Paul et al. 2019; Rosado et al. 2018; Pandey et al. 2024). The highlight of TCCM framework is it overcomes the shortcomings of traditional systematic review by exploring the theoretical and empirical dimensions of a research domain (Bhattacharjee et al. 2022, Pandey et al. 2024). Consequently, it proves to be a practical tool that ensures a comprehensive understanding of each area of a study domain (Sharma et al. 2023). Therefore, the TCCM analysis enables to identify not just undiscovered areas but also opens avenues for future studies (Paul et al. 2019). Moreover, the following study addresses the gaps reported by previous studies on GEO in the form of TCCM as well as propagated future research agenda in the field (Pandey et al. 2024). Here, the second research question provides a summary of "Theories", "Contexts", "Characteristics" and "Methodologies".

2.3 Keyword and Database Search Strategy:

The usage of relevant keywords is crucial for any study. Here, the researcher used a set of keywords such as "green entrepreneurial orientation", "sustainable entrepreneurial orientation", "environmental entrepreneurial orientation", "green innovation", and "sustainable performance". To connect keywords and create search strings, Boolean connectors such as "OR" and "AND" were employed. The first phase in developing a systematic literature review is to determine the review's importance which comes from a research question (Nagaraj et.al., 2024). Charrois et al. (2015) suggest that scholars to employ minimum two databases while structuring an SLR. Hence, the present study fulfils the condition by choosing the following databases: Scopus, Google Scholar, Emerald, and Wiley.

2.4 Inclusion and Exclusion criteria:

The inclusion and exclusion criteria proposed by Paul et al. (2019), Srivastava et al. (2020), and Dogra et al. (2022), prove to provide a framework in selecting appropriate research publications for this SLR (Sana et al. 2023).

The inclusion criteria include i) studies where "GEO" is 'studied as a variable or a concept'; ii) The studies published from 2018 to December 2024; iii) 'studies must be published in English'; iv) The studies limited to full-text 'journal articles', and peer-reviewed journals were considered.

The study extracted a total of 698 articles based on specified keywords in the given databases. The study eliminated duplicate articles of about 482 to narrow down the study domain. The researcher then shortlisted the given set of articles with inclusion and exclusion criteria standards. Around 216 papers were included based on the inclusion criteria. The remaining 156 articles were excluded as it does not meet the aim of the study. And finally, the study includes 60 articles which are published in recent times, ranging from 2018 to 2024.

2.5 **PRISMA Flow Diagram:**

This SLR adopted the PRIMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to produce a systematic literature review. PRISMA is an ideal strategy for carrying out SLR as it enables reviewers to document their review plans accurately, thus refraining from making irrelevant decisions (Wirani et al. 2024). PRISMA methodology provides a standardized framework for assuring the quality of the revision and replication process (Tedja et al. 2024). The study selection process is illustrated in Figure 1.

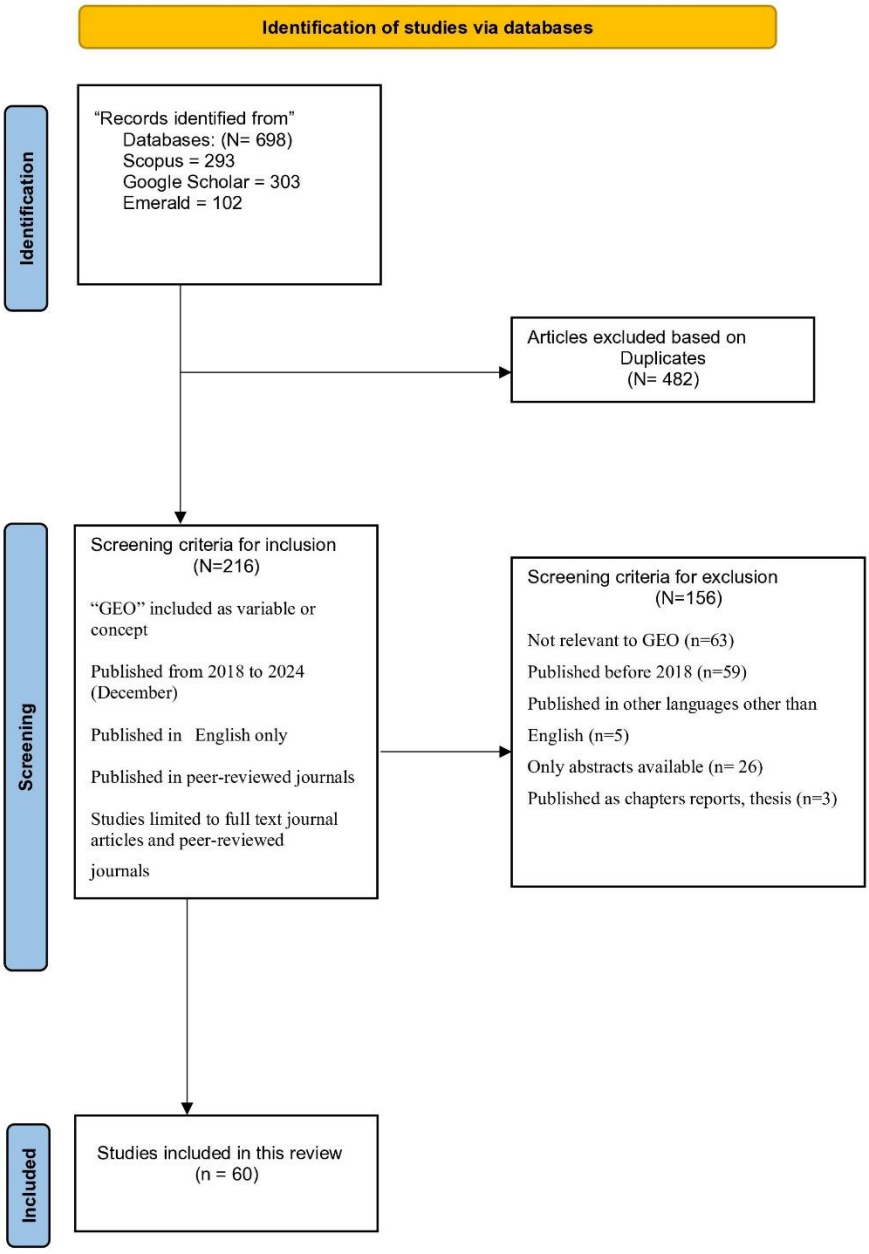

Figure 1: Selection of papers in the PRISMA flow diagram

3. What is the current status of knowledge about "green entrepreneurial orientation" 'in literature?'

To address the first research question, the study discusses on number of articles included in the article along with year, title, journal and key theme, top influential journals, and top cited authors among the literatures.

3.1: Publication Timeline:

The review analyses the current state of knowledge on GEO by arranging the literature according to years of publication, with a note on the key theme discussed which is presented (See the table 1). This throws light on different dimensions of GEO being studied over a period.

Table 1 Articles considered for the review:

Sr no.	Author	Title	Journal	Key Theme
1	Jiang W. et al. (2018)'	Green entrepreneurial orientation for enhancing firm performance: A dynamic capability perspective	Journal of Cleaner Production	Environmental & financial performance enhanced due to GEO with moderating effect of green technology and knowledge
2	Olawale Fatoki (2019)	Green entrepreneurial orientation and firm performance in South Africa	Entrepreneurship and sustainability issues	GEO boosts sustainable performance in hospitality sector performance.
3	Pratono et al. (2019)	Achieving sustainable competitive advantage through green entrepreneurial orientation and market orientation: The role of interorganisational learning	Bottom Line	Role of Inter-organisational learning in connecting to GEO, market focus and sustainable advantage.
4	Guo Y.; et al. (2020)	Green Entrepreneurial Orientation and Green Innovation: The Mediating Effect of Supply Chain Learning	Sage	GEO drives green innovation via supply chain learning.
5	Habib M.A.et al. (2020)	The impact of green entrepreneurial orientation, market orientation and green supply chain management practices on sustainable firm performance	Cogent business and management	GEO, market strategy and supply chain practices drives sustainable performance.
6	Luu T.T. (2021)	Green creative behaviour in the tourism industry: the role of green entrepreneurial orientation and a dual-mediation mechanism	Journal of Sustainable Tourism	GEO fosters employees' green creativity through self-efficacy, passion, and communication in tourism sector.
7	Golsefid-Alavi M et al. (2021)	A review of the literature on entrepreneurship and the environment: Opportunities for researching on the green entrepreneurial orientation	Environmental Engineering and Management Journal	SLR on internal and external factors affecting GEO.
8	Muangmee et al. (2021)	Green entrepreneurial orientation and green innovation in small and medium-sized enterprises (Smes)	Social sciences	GEO and green innovation impact on sustainable performance of SMEs in automotive parts industry.
9	Habib M et al. (2021)	Impact of strategic orientations on the implementation of green supply chain management practices and sustainable firm performance	Sustainability	Influence of green entrepreneurial, market and knowledge management orientation on supply chain practices and sustainability.
10	Zhang et al. (2021)	Does Green Proactiveness Orientation Improve the Performance of Agricultural New Ventures in China? The Mediating Effect of Sustainable Opportunity Recognition	Sage open	Explores the role of green proactiveness orientation, sustainable opportunity recognition on agriculture venture performance and environmental performance.
11	Xie Q. et al. (2022)	The investigation of sustainable environmental performance of manufacturing companies: mediating role of organizational support and moderating role of CSR	Economic Research	GEO & sustainable entrepreneurship fosters environmental performance with emphasis on organisational ambidexterity and CSR.
12	Liu N. et al. (2022)	The Relationship between Institutional Pressure, Green Entrepreneurial Orientation, and Entrepreneurial Performance—The Moderating Effect of Network Centrality	Sustainability	Examines the role of institutional pressure on new venture performance highlighting GEO and network centrality.
13	Verma et al. (2022)	Developing leadership styles and green entrepreneurial orientation to measure organization growth: a study on Indian green organizations	Journal of entrepreneurship in emerging economies	Investigating influence of different leadership styles on green entrepreneurship and organisational growth.
14	Tze San O et al. (2022)	GEO and sustainable performance: the moderating role of GTD and environmental consciousness	Journal of intellectual capital	Green technology dynamism and environmental consciousness strengthen GEO and Sustainable performance relationship.
15	Majali T et al. (2022)	Green Transformational Leadership, Green Entrepreneurial Orientation and Performance of SMEs: The Mediating Role of Green Product Innovation	Journal of open innovation	Highlights role of transformational green leadership and GEO on sustainable performance with a mediation of green product innovation.
16	Li W et al. (2022)	Relationship between green entrepreneurship orientation, integration of opportunity and resource capacities and sustainable competitive advantage	Frontiers in Psychology	Proposed concept of IORC (integration of opportunity and resources capabilities) to strengthen the relationship of GEO and Sustainable competitive advantage.
17	Ye F. et al. (2022)	Green entrepreneurial orientation, boundary-spanning research and enterprise sustainable performance: The moderating role of environmental dynamism	Frontiers in Psychology	GEO enhances enterprise sustainability by promoting boundary spanning search.

18	Ameer et al. (2023)	Green entrepreneurial orientation and corporate environmental performance: A systematic literature review	European management Journal	SLR comprehending micro level, meso level and macro level factors driving GEO.
19	Yan Z. et al. (2023)'	Research on the Influencing Factors of Green Entrepreneurial Orientation of Manufacturing Start-ups	Journal of the knowledge economy	Explores the influence of individual, organisational, and environmental factors that drive GEO in manufacturing start-ups.
20	Stacenko et al. (2023)	Building the road to green entrepreneurial orientation in higher education and research: Sharing experience and looking ahead	EU green deal and implementation	Enhancing entrepreneurship education, skill ecosystem, innovation and social inclusion through dual education strategies.
21	Xin Y et al. (2023)	Do international resources configure SMEs' sustainable performance in the digital era? Evidence from Pakistan	Resources policy	Influence of international resources and GEO on SME sustainability for long term
22	Xiao H et al. (2023)	Modelling the significance of strategic orientation on green innovation: mediation of green dynamic capabilities	Humanities and social sciences communications	Understanding interaction between strategic orientation, dynamic capability, and green innovation in manufacturing firm
23	Yang X.; Liu X. (2023)	The Influence of Green Entrepreneurship Orientation on Enterprise Performance Based on the TPB Model	Applied Mathematics and Nonlinear Sciences	Examines green innovation's role in fostering sustainable transformation using TPB model
24	Khan N et al. (2023)	Corporate sustainability entrepreneurship: The role of green entrepreneurial orientation and organizational resilience capacity for green innovation	Journal of business research	Integrates TOE model to examine technological, organisational, and environmental factors that drive GEO and green innovation.
25	Muneeb et al. (2023)	Revamping Sustainable Strategies for Hyper-Local Restaurants: A Multi-Criteria Decision-Making Framework and Resource-Based View	FIIB Business Review	Sustainability strategies and critical success factors analysed using advanced decision-making methods for practical insights.
26	Alshebami A.S. (2023)	Green Innovation, Self-Efficacy, Entrepreneurial Orientation and Economic Performance: Interactions among Saudi Small Enterprises	Sustainability	Interactions between self-efficacy and GEO that drives green innovation to economic performance.
27	Asad M et al. (2023)	Green entrepreneurial orientation for enhancing SMEs financial and environmental performance: Synergetic moderation of green technology dynamism and knowledge transfer and integration	Cogent business & Management	Influence of GEO on environmental and financial performance with focus on technology and knowledge transfer.
28	Ijaz et al. (2023)	Exploring moderating effects of industry 4.0 adoption on sustainable performance of Malaysian manufacturing organizations	Journal of industrial and production engineering	Role of Industry 4.0 adoption along with organisational capabilities and stakeholder pressure in fostering sustainability.
29	Shehzad et al (2023)	Do green entrepreneurial orientation and green knowledge management matter in the pursuit of ambidextrous green innovation: A moderated mediation model	Journal of cleaner production	Explores impact of GEO on green innovation with focus on knowledge management and resource orchestration capability.
30	Asad M et al. (2023)	Mediating role of green innovation and moderating role of resource acquisition with firm age between green entrepreneurial orientation and performance of entrepreneurial firms	Cogent Business & Management	Analyses effect of GEO on firm performance with emphasis on green innovation and resource acquisition.
31	Asif M. (2023)	Environmental Efficiency of Enterprises: Trends, Strategy, Innovations	Energies	Interactions between GEO, 'proactive sustainability strategy and green process innovation on environmental performance'
32	Bhatti et al. (2023)	Modelling the significance of green orientation and culture on green innovation performance: moderating effect of firm size and green implementation	Environmental science and pollution research	Examines the role of strategic orientation, organisational culture, and management system in environmental sustainability.
33	Yadegaridehkordi et al. (2023)	Determinants of environmental, financial, and social sustainable performance of manufacturing SMEs in Malaysia	Sustainable production	Investigating SME sustainable performance in emerging economies, highlighting leadership commitment and GEO as critical determinants.
34	Rahman M et al. (2023)	Strategic drivers of corporate environmental sustainability	Fashion and environment sustainability	Influence of proactive sustainable strategies, green innovation, and circular economy practices on corporate environmental sustainability.

35	Makhloufi L. (2024)	Do knowledge sharing and big data analytics capabilities matter for green absorptive capacity and green entrepreneurship orientation? Implications for green innovation	Industrial management & data systems	Big data analytics capabilities enhance absorptive capacity, green entrepreneurship and knowledge sharing for innovation
36	Al Koliby et al. (2024)	Green entrepreneurial orientation and technological green innovation: does resources orchestration capability matter?	Bottom line	Linkage between green entrepreneurial orientation and resource orchestration capability towards technological innovation.
37	Wu W. et al. (2024)'	How Does Environmental Corporate Social Responsibility Affect Technological Innovation? The Role of Green Entrepreneurial Orientation and Green Intellectual Capital	Journal of knowledge economy	Identifying the role of Environmental CSR in fostering firms' technological innovation with focus on GEO and green Intellectual capital.
38	Cheng et al. (2024)	Leveraging employee green entrepreneurial orientation for enhancing environmental performance: The multi-level role of green creativity and green decision comprehensiveness	European management journal	Analyses effect of Employee GEO on employee environmental performance through employee green creativity, passion, and green information.
39	Asad M. et al. (2024)	Green entrepreneurial leadership, and performance of entrepreneurial firms: does green product innovation mediates?	Cogent business & Management	Determines the role of transformational leadership in the study of GEO, green product innovation and performance.
40	Song Y et al. (2024)	Green entrepreneurial orientation, green marketing orientation, SMEs resilience amidst COVID-19: the moderation role of network ties	Current psychology	Investigates the role of GEO and green market orientation in assisting SME resilience.
41	Ishaq et al. (2024)	Accomplishing sustainable performance through leaders' competencies, green entrepreneurial orientation, and innovation in an emerging economy: Moderating role of institutional support	Business strategy and the environment	Identifies leadership competencies as a crucial factor in establishing green innovation and sustainability link.
42	Zhang X. et al. (2024)	External pressure, internal managerial interpretation and green entrepreneurial orientation	Management decision	Examines influence of external 'pressure and managerial interpretation on promoting GEO in agricultural enterprises.
43	Zhang et al. (2024)	Does Green Entrepreneurial Orientation Improve the Sustainable Performance of Agribusiness? Evidence from China	Sage open	Introduction of green intellectual capital and sustainable business model innovation to strengthen GEO-Sustainability link.
44	Al Halbusi et al. (2024)	Greening the future: analysing green entrepreneurial orientation, green knowledge management and digital transformation for sustainable innovation and circular economy	European journal of innovation management	Impact of GEO, knowledge sharing, digital capability and strategy on circular economy and sustainable innovation.
45	Ermawati et al. (2024)'	The effects of internal driver, external pressure, and green entrepreneurial orientation (GEO) on green supply chain management (GSCM) performance through GSCM practice in wood processing companies in Lumajang district	Uncertain SCM	The role of internal drivers and external pressure analysed for implementation of green supply chain management practices. In GEO context.
46	Baquero A. (2024)	Optimizing green knowledge acquisition through entrepreneurial orientation and resource orchestration for sustainable business performance	Marketing intelligence & planning	Explores the role of GEO, knowledge acquisition, and resource orchestration that influence corporate sustainability.
47	Riaz S et al. (2024)	Role of social networks and entrepreneurial success: Understanding the dynamics of knowledge acquisition and green entrepreneurial orientation	Journal of cleaner production	Investigate the role of social network ties in entrepreneurial success with moderating effect of GEO.
48	Gong Z et al. (2024)	The Moderating Role of Entrepreneurial Narrative in the Impact of Environmental Regulation on Migrant Workers' Entrepreneurial Legitimacy from a Green Entrepreneurship Perspective	Sustainability	Analyse impact of environmental regulatory pressure on migrant entrepreneur's legitimacy.
49	Anin et al. (2024)	Green entrepreneurial orientation and firm performance: do green purchasing and supply chain integration matter?	Cogent business & Management	Integrates GEO and Green SCM for optimizing environmental and commercial outcomes.
50	Liang Y et al. (2024)	The Interplay of Environmental Dynamism, Digitalization Capability, Green Entrepreneurial Orientation, and Sustainable Performance	Sustainability	Role of GEO in interaction between Environmental dynamism, digitalisation capability and sustainability.
51	Al Karim et al. (2024)	Integrating Green Entrepreneurial Orientation, Green Information Systems, and Management Support with Green Supply	Sustainability	Investigating influence of GEO, Green IT and management support on GSCM.

		Chain Management to Foster Firms' Environmental Performance		
52	Baquero A, (2024)	Linking green entrepreneurial orientation and ambidextrous green innovation to stimulate green performance: a moderated mediation approach	Business process management Journal	Exploring 'GEO, ambidextrous green innovation, and resource orchestration capability on green performance'.
53	Tuncer B et al. (2024)	A Systematic Literature Review and Conceptual Framework on Green Entrepreneurial Orientation	Administrative sciences	SLR on GEO elaborating on mediating and moderating factors that affect the GEO-outcome connections.
54	Al-Swidi et al. (2024)	Innovate or perish: can green entrepreneurial orientation foster green innovation by leveraging green manufacturing practices under different levels of green technology turbulence?	Journal of manufacturing technology management	Role of GEO in fostering green innovation by adopting green practices under technology uncertainty.
55	Manigandan R et al. (2024)	Examining the pathways to success: investigating the mediating role of green innovation in the relationship between green entrepreneurial orientation, green organisational culture, and competitive advantage in the hotel industry	International Journal of work innovation	Inquiring the role of GEO, organisational culture, and green innovation in determining competitive advantage in hospitality sector.
56	Alherimi et al. (2024)	Employees' pro-environmental behaviour in an organization: a case study in the UAE	Scientific reports	Assessing pro-environmental behaviour of employees within the influence of GEO, GHRM, and green leadership.
57	Marzouk R (2024)	The interplay among green absorptive capacity, green entrepreneurial, and learning orientations and their effect on triple bottom line performance	Business strategy and the environment	Interactions between GEO, learning orientation and absorptive capacity in enhancing TBL performance.
58	Shivani S et al. (2024)	Analysing green entrepreneurial orientation drivers: Insights from the Indian manufacturing industry	Journal of international council for small business	Identifying and operationalising drivers of GEO for sustainable environmental practices.
59	Hu W et al. (2024)	Relationship between Green Entrepreneurial Orientation, Green Intellectual Capital, Green Supply Chain Management, and Sustainable Performance: The Moderating Role of Environmental Uncertainty	Procedia of multidisciplinary research	Analyse the role of GEO, 'intellectual capital, supply chain management on sustainable performance in environmental uncertainty' context.
60	Waqas et al. (2024)	Mediating role of green talent management between green strategic orientation and sustainable supply chain performance among SMEs of Oman	Annals of Operations Research	Exploring the impact of GEO, green HRM, green IT, and green Talent management on sustainable supply chain performance.

3.2: Top influential Journals in this review:

The researcher scrutinised the performance of various journals categorised in GEO studies. To provide a comprehensive overview of the various journals and publication status, Table 2 covers the number of articles published along with ABDC/Quartile category and its impact factor. Here, the researcher included only those journals which has more than 1 publication from the selected articles. As per the review analysis, "Sustainability" is one of the top journals identified as a major contributor for the highest number of papers published, followed by Cogent Business & Management with 5 articles. Other relevant journals include "Journal of Cleaner Production", "Business Strategy & Environment", "Bottom Line", "Journal of Knowledge Economy", "Sage Open", "European Management of Journal" and "Frontiers in Psychology" with a couple of publications in the GEO field.

Table 2: Prominent Journals published related articles

Journal	No. of articles	References	ABDC/ Quartile	Impact Factor
Sustainability	6	Habib et al. (2021), Liu et al. (2022), Alshebami (2023), Gong and Zhuang (2024), Liang et al. (2024), Karim et al. (2024)	Q1	3.3
Cogent Business & Management	5	Habib et al. (2020), Asad et al. (2023), Asad et al. (2024), Asad et al. (2024), Anin et al. (2024)	Q2	3.0
Journal of Cleaner Production	3	Jiang et al. (2018), Shehzad et al. (2023), Riaz et al. (2024)	Q1 A	9.7
Business strategy and the environment	2	Ishaq et al. (2023), Marzouk and Ebrashi (2023)	Q1 A	12.5
Bottom Line	2	Pratono et al. (2019), Koliby et al. (2024)	Q1	8.0
Journal of knowledge economy	2	Yan and Hu (2023), Wu and Yu (2023)	Q3 C	4.0
Sage open	2	Zhang and Li (2021), Zhang et al. (2024)	Q2	2.0
European Management of Journal	2	Ameer and Khan (2022), Cheng and Shiu (2024)	Q1 B	7.5

Frontiers in Psychology	2	Li et al. (2022), Ye et al. (2022)	Q1	2.6

3.3 Most Influential Authors in GEO study:

Table 3 lists the top 10 authors based on the number of citations. Based on the citation structure analysis, Jiang et al. (2018) is identified as one of the most productive and influential authors in the field of green entrepreneurial orientation, with more than 463 citations followed by Pratono et al. (2019) with 278 citations and Habib et al. (2020) with around 178 citations.

Table 3 Top ten articles with most citations

Rank	Source	Journal	Citations
1	Jiang et al. (2018)	Journal of Cleaner Production	463
2	Pratono et al. (2019)	Bottom Line	278
3	Habib et al. (2020)	cogent business & mgmt.	238
4	Muangmee et al. (2021)	social science	178
5	Guo et al. (2020)	Sage	169
6	Habib et al. (2021)	sustainability	141
7	Majali et al. (2022)	Journal of open innovation	140
8	Asad et al. (2024)	cogent business & Management	127
9	Shehzad et al. (2023)	journal of cleaner production	108
10	Luu (2020)	Journal of Sustainable Tourism	94

4. What theories, contexts and methods have been used in GEO research?

To address the second research question, this section explains the various theoretical framework used in GEO research, methodologies employed across studies and the diverse contexts in which GEO is explored and implemented.

4.1 Theoretical Perspectives:

Theories help researchers to address research inquiries, and as a result showcase a great potential to enhance existing literature (Lim et al. 2021; Sana et al. 2023; Vijaykumar R, et al. 2024). The current study reveals significant insights into the theories applied to GEO using the TCCM framework proposed by Paul and Rosado (2019). It is noted that around 25 theories have been extensively used to understand the concept in the study domain. The current study has focused to review single theory usage as well as multiple theory usage in GEO context. Some of the most recognised theories were Resource-based view theory, Natural Resource based view theory and Dynamic Capability theory.

The Resource-based View Theory is identified as one of the most influential theories in GEO study wherein it has been applied a single usage as well as integrated with multiple theories with a view to widen the scope of GEO. Around 25% (n=15) studies has used RBV theory to study the influence of GEO on business performance. The theory basically asserts the view of allocating wide range of unique and inimitable resources within an organisation as a means to remain competitive, boost revenue and gain long-term competitive advantage over a period (Barney 1991; Muangmee et al. 2021; Jiang et al. 2018; Sirmon et al. 2011; Varanavicius et al. 2015; Tuncer et al. 2024). RBV theory used as a single theory (examples, Muangmee et al. 2021; Xin et al. 2022; Muneeb et al. 2023; Baquero 2024) and, also integrated with multiple other theories like Stakeholder theory, Tripple Bottom Line theory (Ijaz Baig et al. 2023), Green Utility Model (Asad et al. 2024), Ecology Modernization Theory (Bhatti, 2023), Institutional Theory (Yadegaridehkordi et al. 2023), Resource Orchestration Theory, Intellectual capital Theory (Zhang et al. 2024) to broaden the GEO perspectives into new avenues.

Next most used theories from the selected reviews were Natural Resource-based view theory. NRBV theory is an extension of RBV theory proposed by Hart (1995). According to Hart (1995), NRBV extends to the environmental dimension as a major pillar so as to achieve “environmentally sustainable economic activities” by way of sustainable integration, pollution prevention and product stewardship (Marzouk et al. 2024). NRBV theory encompasses three closely related strategic capabilities such as pollution prevention, product stewardship, and sustainable development (Karim et al. 2024). Almost 13% studies have widely used NRBV theory as a single use (Cheng et al. 2024; Baquero 2024) as well as used theoretical integrated perspectives of NRBV with Dynamic Capability Theory (Habib et al. 2021), Practice based view theory, contingency theory (Al Swidi et al. 2023).

Dynamic Capability Theory is another crucial theory discussed among GEO study. This theory adds to the extension of RBV theory, and considers GEO as a dynamic capability majorly for three reasons (Asad et al. 2023; Ameer et al. 2023; Tuncer et al. 2024). GEO has the dynamic capabilities to sense, seize and transform the

opportunities with its qualities of green innovation, risk taking and proactive action plan (Jiang et al. 2018). Some examples of references wherein DCT is studied as a single theory were (Jiang et al. 2018; Habib et al. 2020; Makhloufi, L. 2024), and, also applied to integrated perspectives of Dynamic Capability View Theory with NRBV (Habib et al. 2021), Organisational Search Theory (Ye & Shen 2022), RBV theory (Xiao et al. 2023), Resource Dependence Theory (Wu et al. 2024), Contingency Theory (Liang et al. 2024).

Stakeholder and Institutional Theories are central to GEO studies. Stakeholder theory explores how stakeholders influence business performance (Edward et al. 2010), while Institutional theory examines how the institutional environment shapes organizational frameworks (DiMaggio et al. 1983).

Recent studies introduced new perspectives. Zhang et al. (2024) applied Attention-Based View theory, focusing on managerial attention to operational logic. Riaz et al. (2024) used Network theory to analyze social ties in entrepreneurship. Intellectual Capital theory emphasized integrating knowledge for competitive advantage, while Resource Orchestration theory (Al Koliby et al. 2024) addressed resource management. Ishaq et al. (2024) applied Upper Echelons theory, exploring leadership traits in addressing ecological challenges, social exchange theory emphasizing on bringing positive organisational policies and practices to promote green behaviours in employees (Alherimi et al. 2024). Green utility model theory is another supporting theory utilised in GEO research focussed on patents which helps to enhance environmental image and recognition (Asad et al. 2024). Green management theory specifies on shift of traditional businesses to environmental responsible business inorder to mitigate negative impact on environment (Anin et al. 2024).

4.2 Context:

In terms of context, the researcher investigates different industries and countries that have supported GEO research.

4.2.1 Industry-specific Context:

In terms of Industry context, most of the empirical papers were gathered from multiple industries as an attempt to generalise the results (Tuncer et al. 2024). The majority of the papers focused on manufacturing sector (93%), with firm size of SMEs (48%) and large-scale enterprises (26%). Given the significance of GEO to managers, it has been examined in certain single industry-specific contexts, such as, Agriculture sector (Zhang et al. 2021; Asif et al. 2023), the Automotive Parts industry (Muangmee et al. 2021), Startups (Li et al. 2022), the Textile Industry (Habib et al. 2020; Habib et al. 2021), Wood Processing (Ermawati et al. 2024), and the Tourism & Hospitality Sector (Raghuram et al. 2023). The context (i.e. Industry) examined in GEO research is displayed in Table 4.

Table 4: Industry specific context

Industry	No of articles	Examples
Agriculture	4	Zhang and Li (2021), Asif (2023)
Automotive parts industry	1	Muangmee et al. (2021)
Tourism and Hospitality sector	4	Raghuram et al. (2023), Luu (2020)
Textile industry	2	Habib et al. (2020), Habib et.al (2021)
Wood processing	1	Ermawati et al. (2024)
Migrant entrepreneurs	1	Gong et al. (2024)
Startups	2	Yan and Hu (2023), Li et al. (2022)
Multiple industries SMEs	29	Jiang et al. (2018), Pratono et al. (2019)
Multiple industries (large scale)	16	Xiao et al. (2023), Khan et al. (2023)

4.2.2 Country-specific Context:

In this section, the sample's country of origin is discussed. Table 5 showcases the top ten countries which has been investigated in GEO research. From the review analysis, it is inferred that Asian Scholars are more interested in GEO research. China accounted for the greatest number of research publications in the GEO context, with more than 20 studies, followed by Pakistan with 8 publications, India with 4 papers and the UAE with 4 papers. Some other countries which has shown interest in the GEO study were Bangladesh, South Africa, Indonesia, Malaysia, Saudi Arabia, Thailand, Vietnam, Yemen, etc.

Table 5: Top 10 Countries investigated in the GEO context:

Country	No of studies	Examples
China	31	Jiang et al. (2018), Zhang (2024)
Pakistan	8	Xin (2023), Khan et al. (2023).
India	4	Asif (2023), Raghuram (2024)
UAE	4	Cheng (2024), Baquero (2024)

Bangladesh	3	Karim et al. (2024)
South Africa	2	Fatoki (2019)
Indonesia	2	Ermawati et al. (2024)
Malaysia	2	Yadegaridehkordi et al (2023)
Saudi Arabia	2	Al Halbusi et al. (2024)
Thailand	2	Makhloufi (2024)

4.3 Characteristics:

This section sketches majorly on the 'independent, mediating, and moderating variables' examined in GEO study. As the previous study Tuncer (2024), suggested, majority of the studies has been done on firm level factors and very few studies relate to individual level factors. The current study aims to add on more variables undertaken in the further literatures till December 2024.

4.3.1 GEO Antecedents:

In the literature of green entrepreneurship, innovation and environment, GEO is considered as one of the most contemporary and significant concepts (Tuncer et al. 2024). Researchers precisely comprehend and anticipate green entrepreneurial attitudes and practices as key drivers that can influence green innovation (Tuncer et al. 2024). One the studies by Ameer & Khan (2023), has lent a broad underlining of the various micro level, meso level and macro level factors that can potentially drive GEO. This study analyses individual level, organisational level and environmental level factors that drives GEO to green innovation and sustainability. Some of the individual level drivers of GEO studied were entrepreneurial calling, priori knowledge (Yan & Hu, 2023), green entrepreneurial self-efficacy (Alshebami, 2023). Most of the studies investigates organisational level drivers such as transformational leadership styles and competencies (Majali et al. 2022; Verma & Kumar, 2022), absorptive capacity (Zahra et al. 2009; Makhloufi, 2024), institutional pressure (Liu et al. 2022), organisational resilience (Yan & Hu, 2023), big data analytics (Makhloufi, 2024), green SCM (Karim et al. 2024), green HRM (Alherimi et al. 2024). Some of the environmental drivers like customer demand, competitive pressure (Yan & Hu, 2023), Environmental CSR (Wu & Yu, 2023), environmental regulatory pressure (Gong et al. 2024), Environment commitment (Alherimi, 2024), managerial environmental concern (Makhloufi et al. 2023), and Government environmental regulation (Zhang et al. 2024). Studies also present TOE model (Verma et al. 2022) to GEO concept.

4.3.2 GEO Interactions:

Indirect links expand the scope of GEO studies. Mediators clarify how GEO impacts outcomes, while moderators enhance organizational performance under specific conditions. These roles help scholars deepen understanding of GEO and its relationships with antecedents and outcomes, enriching environmental and green entrepreneurship research (Ameer et al. 2023; Tuncer et al. 2024).

The interacting variables considered in recent studies of GEO context were Green Intellectual Capital, Sustainable business model innovation (Zhang et al. 2024) which highlights the integration of green knowledge, skills, and sustainable business model architecture, to deliver customer value and competitive advantage. Another perspective of GEO embraces digitalization capability (Liang et al. 2024) and digital transformation as an efficient solution for twin transition.

Intervening variables positively influencing GEO-performance links include green technology turbulence (Al-Swidi et al. 2023), network centrality (Liu et al. 2022), IORC (Li et al. 2022), Industry 4.0 (Ijaz et al. 2023), resource orchestration (Al Koliby et al. 2024), network ties (Song & Wang, 2024), and digital transformation (Al Halbusi et al. 2024).

4.3.3 GEO Outcomes:

The current literature analyses that majority of the studies focussed on performance-oriented outcomes such as Tripple bottom line performance (Marzouk, 2024), sustainable performance (Baquero 2024), Competitive advantage (Raghuram et al. 2024), firm performance. GEO is also linked to firm related outcomes such as, green innovation performance (Bhatti et al. 2023), Ambidextrous Green Innovation (Shehzad et al. 2023), Technological green innovation (Wu et al. 2024), green supply chain performance (Ermawati et al. 2024), etc. At the same time, GEO could also influence certain individual level outcomes such as green creative behaviour (Luu, 2021; Tuncer et al. 2024), Pro-environmental behaviour (Alherimi et al. 2024), entrepreneurial legitimacy (Gong et al. 2024). The current study could also figure out new perspectives brought in to the GEO study, like, SME resilience (Song & Wang 2024), sustainability-oriented innovation and circular economy (Al Halbusi et al. 2024).

4.4 Methodological Approaches:

Of the selected reviews, SEM (Structural Equation Modelling Techniques) is the most extensively applied statistical techniques for empirical research (Tuncer & Korchagina 2024), followed by hierarchical regression models (Jiang et al. 2018), Multi SEM approach (Luu 2021), MCDM & BMW method (Multi-criteria Decision Making & Best-Worst method) (Muneeb et al. 2023). Majority of the studies employed Smart PLS software being variance-based approach and assists theory development, flexibility in handling of complex models, and examining direct-indirect path effects in a structural model (Song & Wang 2024). Other software's' identified were Mplus 7.2, Lisrel, and AMOS which is primarily a co-variance-based approach.

With regards to sampling techniques, non-probability sampling such as convenience sampling, purposive sampling, and snowball sampling is one of the most widely used sampling techniques. To mark a difference, few studies employed probability sampling such as simple random sampling (Ishaq et al. 2024), stratified sampling (Zhang et al. 2024), and systematic sampling (Majali et al. 2022).

5. What are the prospects for green entrepreneurial innovations 'research in the future*?*'

With regards to third objective of the paper, the researcher attempts to suggest future scope in the GEO research from the selected literature analysis. The current literature study adopted TCCM approach which is proposed by Paul & Rosado-Serrano (2019). This framework has helped the study to identify research gaps on four grounds, namely, theory development, contexts, characteristics, and methodology (Adil et al. 2022; Paul & Rosado-Serrano 2019; Sana et al. 2023).

5.1: Summary of the findings and future scope:

Theoretical Lens: This SLR aids the future studies to capture knowledge on various theoretical lens applied in GEO research both as a single use as well as integrating multiple theories so as to captivate new dimensions for GEO research and generalise the results. The findings highlight widely used theories like RBV, NRBV, Dynamic Capability View, and Stakeholder Theory, with some studies integrating multiple frameworks, including Social Network Theory, Green Intellectual Capital, and Resource Orchestration Theory. However, significant number of studies lacked to employ any theoretical framework which pose a barrier to comprehend GEO. Hence, it is recommended in future, to validate empirical research with appropriate theoretical base, also, to consider an integrated theoretical approach for a broader scope. Future studies may contribute to Social Resource based view theory, Theory of uncertainty, Social capital theory etc.

Context Lens: The context in the current study has been divided into two aspects, Country specific and Industry specific. This is undertaken to amplify GEO investigations and identify scope in different countries and industry aspect. Findings of this review reveal that almost 13 countries have applied GEO studies empirically, out of which, more than 50% of the studies undertook in China, 13% in Pakistan, followed by India, UAE, Bangladesh etc. Additionally, 75% of the empirical investigations focussed on multiple industries rather than individual industries, focussing on large-scale and small-scale manufacturing sector. This implies that an uneven distribution of samples holds barrier to generalise the concept globally. Hence, this review recommends future scholars to consider more developing countries, micro-small-medium sectors, and specific single industries, as each industry showcase unique dynamics, regulatory structure, market and technological trends and innovations, like Food processing, Transportation, Pharmaceutical, IT etc for validating a significant impact on environment research.

Characteristics Lens: This study has portrayed the antecedents, GEO interactions and outcomes of GEO from selected reviews. The literature identifies individual level, organisational level, and environmental level factors as GEO drivers, and found majority of the studies adopted organisational level factors to comprehend GEO whereas there are only few studies examined on individual level factors. In the same note, the review highlights on different interacting and intervening variables to analyse GEO as multi-dimensional. The results reveal that GEO outcomes are widely associated with performance-oriented rather than individual level outcomes. Therefore, future researchers are recommended to increase the studies in GEO in different contexts by integrating potential variables into the relationship of GEO, green innovation, and sustainability such as Government intervention, social capital etc.

Methodological lens: Based on the results of this review, this SLR finds that most of the studies has investigated quantitatively by adopting SEM analysis in Smart PLS software. Similarly, other statistical techniques employed were hierarchical regression, multiple regression, and linear regression models. With regards to sampling techniques, majority employed non-probability techniques while few attempted for probability sampling. Nevertheless, the study recommends future investigators to use mixed-method approach and qualitative

methods for its exploratory nature, consider scientific sampling to remove bias and may experiment on new statistical techniques.

5.2 Managerial Implications:

This study aids practitioners and academicians in socio-economic development. It provides managers with insights into green strategic orientations, green innovation, and sustainable performance. Managers can address challenges, seize opportunities, and adopt green practices, innovation, and digital technology to enhance economic and environmental performance, ensuring competitiveness in a sustainable transformation.

5.3 Unique Contribution:

This SLR paper has adopted one of the scientific methods of structuring an SLR called TCCM framework (Theory-Contexts-Characteristics-Methodology) proposed by Paul & Rosado-Serrano (2019). This TCCM framework is said to provide highest level of clarity and coverage in literature analysis (Paul & Bhukya, 2021; Sana et al. 2023). This framework assist study to recognise gaps in terms of theoretical and empirical facets, study contexts, characteristics as well as methodologies applied in several literatures in a particular research domain (Adil et al. 2022; Paul & Rosado-Serrano, 2019). The results, insights and discussion prove to be useful for top management, managers, academicians, Government, and policymakers to understand the latest trends in GEO research and adopt proactive strategies & regulations in dealing with green economy transition. The interpretations developed in this study may prove helpful for developing countries in delivering social value to customers and meeting SDG goals.

5.4 Limitations of the Study:

While this study addressed prior limitations using the TCCM approach, some gaps remain. It analysed articles from 2018–2024, excluded bibliographic coupling and co-authorship ties, used limited keywords, and included only three databases. Future research should expand databases, explore additional variables, and address discrepancies in the GEO concept.

5.5 Conclusion:

In today's world, modern societies aim to achieve social welfare and economic prosperity while balancing a clean environment. Nowadays, the environment is linked as an inseparable element from other facets of human endeavour such as politics, economics, security etc. Since sustainability has emerged to be the new normal, businesses are forced to review their plans and strategies affecting their firm performance. In today's modern world, where consumers have complete awareness about the environmental issues and hygiene factors, businesses are forced to design, plan, and implement eco-innovative products and services. This may assist business operations to deliver social value, economic value, and environmental value over a period of time.

The recent literature reviews provide clear evidence on the growing importance of GEO concept among academicians and policymakers, and the need to understand the concept in a more comprehensive way. The intention of this study is to pin down the possible gaps in the GEO literatures by way of synthesizing, examining, and scrutinizing the available body of knowledge. With a view to achieve this goal, the current study has structured an SLR to identify the nexus between 'green entrepreneurial orientation, green innovation, and its impact on sustainable performance'. The present study aims to bring about clarity in the conceptualisation of GEO in terms of theory development, contexts, characteristics, and methodologies applied in several literatures for the period of 2018 to 2024. Hence, the study applied the PRISMA method and TCCM framework proposed by Paul & Rosado-Serrano (2019). Thus, it is noted that there have been certain gaps identified in the green entrepreneurial orientation context, and propose several future research directions which believed to add significant value to the existing body of knowledge in this field.

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