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Article

Research Prospect of Moderating Factors on Green Innovation and Competitive Advantage: A Review and Bibliometric Analysis

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ABSTRACT

This study aims to provide a comprehensive analysis of existing knowledge on green innovation and competitive advantage, summarize the various moderating factors identified in review articles, and discuss potential moderating factors that could be explored in future research. Following the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines, the systematic literature review (SLR) methodology was employed in this study. A total of 125 articles were extracted from Lens.org. database for review. Additionally, a bibliometric analysis was conducted to fulfill the research objectives. The findings revealed that the field of green innovation has not received sufficient scholarly attention. Further, several potential moderating variables have been identified. Structural changes, green management, managerial focus, gender diversity, green human resource management (GHRM), leadership style, green motives, and technological readiness are identified as potential moderating variables for future research. This study contributes to the understanding of moderating variables between green innovation and competitive advantage. Particularly, this knowledge contributes to future studies aiming to design studies that target these identified possible moderating variables.

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Introduction

Many organizations have adopted green innovation as a strategy to achieve both environmental protection and economic growth. Furthermore, green innovation can help organizations attain sustainable competitive advantages (Hur et al., 2013). Successful green innovation practitioners can attract customers, enhance their market position, and secure a competitive advantage. Consequently, green innovation has become a vital tool for businesses to thrive in the market.

Green innovation can be defined as a new production process and technologies that reduce pollution and negative consequences of resource exploitation (e.g., energy) (Castellacci & Lie, 2017). Green innovation has been divided into product innovation, process innovation, and managerial innovation (Wang, 2019). Green product innovation refers to the production of a new product or service that causes no negative impact on the environment or less than the current or competing product. Green process innovation is the improvement of existing production processes and the use of environmentally friendly technologies to produce goods and provide services that impose no or reduced negative impact on the environment (Wong *et al.,* 2012). Managerial innovation is the "formulation of green objectives and strategies for achieving green innovation should be aligned with daily operations and a specific budget for green innovative thinking." (Tseng *et al.* 2012, p.237).

Although green innovation spans various disciplines, examining it through a business management discipline allows for an analysis of its impact on organizational performance and market positioning. Furthermore, these insights are directly applicable to business practices, and help to identify effective managerial approaches and best practices for implementing green innovations. In the literature, some scholars have discussed green innovation and performance (Weng, *et al.,* 2015; Tang *et al.*, 2018; Wang & Yang, 2021; Miroshnychenko *et al.*, 2017; Zhang *et al.*, 2019; Karabulut & Hatipoğlu, 2020), mediating effect and factors (Novitasari & Agustia, 2021; Aguilera-Caracuel, & Ortiz-de-Mandojana, 2013; Chouaibi *et al.*, 2022; Turulja, & Bajgoric, 2019; Seman, *et al.,* 2019; Ma *et al.,* 2017; Yousaf, 2021; Chang, 2011), moderating effect and factors (Tariq *et al.*, 2019; Chan *et al.*, 2016; Cao & Chen, 2019; Chan *et al.,* 2016), SLR on green innovation (Rupasinghe *et al.,* 2023; Rupasinghe *et al.,* 2024; Dangelico, 2016; Amores-Salvadó, Martín-de Castro, & Navas-López, 2014.), stakeholders pressure on green innovation (Chu *et al.,* 2019; Feng & Chen, 2018; Zhang, *et al.*, 2020a; Seman, *et al,*. 2018; Huang, *et al.*, 2016; Chu *et al.*, 2019; Sing *et al.*, 2022), barriers toward the green innovation (Chien *et al.*, 2021), drivers of green innovations (Galbreath, 2019; Chen, 2008; Ardyan, *et al.*, 2017), green culture (Wang, 2019; Gürlek & Tuna, 2018). Although green innovation has gained importance in recent years and gathered significant scholarly attention, there is a lack of bibliometric studies evaluating the green innovation field. According to the authors' best knowledge, no single study has discussed the moderating factors of green innovation. Moreover, bibliometric analysis helps to find key research areas, dominant themes, and the evolution of concepts within green innovation. Further, by analyzing publication trends, co-authorship patterns, and citation networks, future researchers can distinguish the development route of the field and identify influential works and authors. This analysis reveals underexplored areas and emerging topics that advance the discourse on how green innovation contributes to competitive advantage. To fill the above gap, the present study aims to provide a comprehensive analysis of existing knowledge on green innovation and competitive advantage, summarize the various moderating factors identified in review articles, and discuss potential moderating factors that could be explored in future research.

This study is organized into six sections: Section One provides an introduction and a description of the research objectives. Sections Two, Three, and Four focus on the research method, findings and discussion, and conclusion, respectively. Finally, Section Five presents the research implications, and Section Six addresses the directions for future research and limitations.

2. Method

To carry out a detailed analysis of the literature on green innovation and competitive advantage, the current literature review is based on a bibliometric

analysis of Biblioshiny and VOSviewer software, and it provides a clear knowledge map of a selected theme. A bibliometric analysis is built on mathematical approaches and statistics to make large datasets of existing literature to discover hidden research patterns and map the progress of the scientific field (Rejeb *et al.*, 2023). The visualization of similarities (VOS) technique was applied to cluster the papers (Turzo *et al.*, 2022). The quality of the present study was guaranteed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher *et al.*, 2009). The entire process covered the 06 steps outlined below.

As the first step, in January 2024 analyzed the literature on green innovation and competitive advantage to understand the overview of the research topic and to recognize common keywords used in the field. Articles were downloaded using an advanced search of "green innovation and competitive advantage" as the keyword in the titles in the Lens.org.database. “Green innovation” and “competitive advantage” were found to be the most commonly used keywords indicated in the literature on green innovation. Therefore, this study exclusively employs “green innovation” and “competitive advantage” as keywords. This choice ensures a focused analysis, aligning with the study’s specific emphasis on green innovation and competitive advantage. Researchers selected Lens.org. database because of its easy access and the free access to peer-reviewed articles available in it.

Inclusion criteria were defined in the second step, PRISMA flow diagram was recommended for SLRs (Liberati *et al.*, 2009; Priyashantha *et al.*, 2022) to avoid the bias of article selection. The inclusion criteria are present in Table 1. Journal articles are recommended for SLRs since they ensure methodological quality to develop relevant findings that satisfy internal validity (Rupasinghe *et al.*, 2024). In that sense, only journal articles were considered in this analysis. The field of study included specific academic disciplines or research areas. Economics, business & management, political science, sociology, and psychology are included in the social sciences field. Among them, the present study considered only the “business and management” field to make sure the highly related articles are generated.

Table 1: Article inclusion criteria

Inclusion criterion	Focus on
1	Publications as articles
2	The articles in the English language
3	Published in journal
4	Publications with the keyword “green innovation and competitive Advantage”
5	Field of the study

Source: Authors’ conception

After defining the boundaries of the study, step three involved the data collection on January 2024 at Lens.org. Database. It generated 319 articles at the first stage. At the identification stage, out of the 313 articles, 180 articles were rejected because they were not in the business and management field.

In the fifth step, clean the papers obtained from the process. The remaining 131 articles were downloaded and manually screened by reading the titles and abstracts following the inclusion criteria. Further, the authors manually and independently examined the remaining articles for the exclusion criteria. As the exclusion criteria, methodological suitability was evaluated. The eligibility assessment assures that articles of high methodological excellence are included (Meline, 2006). To confirm this two experts are evaluated methodology of each paper. As a result, 6 articles were rejected since the "methodology was not clear". Finally, 125 articles were selected for the analysis.

In the sixth step, Bibliometric analysis and VOS viewer analysis were performed with the selected 125 papers. To achieve the first objective of the article, keyword co-occurrence analysis was done. Keyword analysis is a widely performed unit of analysis and many links can be seen with the co-occurrence relationship of the keywords in an article (Aparicio *et al.*, 2019). VOS viewer is used to create different maps based on Bibliometric relationships, such as keyword co-occurrence networks, word cloud analysis, and co-citation networks of authors or journals. Biblioshiny of R software was also done to produce basic information about the article set, as "annual scientific production" and "most relevant sources".

Further, this article analyzes the moderating variable between green innovation and competitive advantage.

Researchers read each article and identified the most used moderating variable manually.

3. Findings and Discussion

3.1 Article Characteristics

Table 2 illustrates the main information of the selected articles in the review. There were 125 articles published in 54 journals by 382 authors. The annual growth rate is 11.74%, and the total number of references considered for the review was 7674. Further, the total number of keywords included in the review was 172.

Table 2: Main Information about Data

Description	Results
Timespan	1990:2023
Sources (Journals)	54
Documents	125
Annual Growth Rate %	11.74
References	7674
Author's Keywords	172
Authors	382
journal article	125

Source:(Biblioshiny Software, 2024)

Figure 1 shows the annual Scientific Production and which is time-to-time increase and a gradual increase after 2018. It also indicated that most of the studies were completed in 2022. It means scholars have been more focused on green innovation after 2022. However, Takalo *et al.* (2021) and Li *et al.*, (2017) found that after 2015, green innovation was popular among scholars. Rupasinghe *et al.* 2023 found that the popularity of green innovation started after 2018. However, the post-2018 trend in green innovation research is driven by a combination of several key factors. First, developed countries have strengthened global climate policies like the Paris Agreement (2015), European Green Deal (2019), and China's Carbon Neutrality Pledge (2020) (Andrijevic *et al.*, 2020). Second, rapid progress in renewable energy (solar, wind, hydrogen) made green technologies more viable (Zhang *et al.*, 2020c). Third, numerous companies adopted Environmental, Social, and Governance (ESG) frameworks, increasing investments in sustainable business models**.** As a result, circular economy strategies gained popularity, pushing industries toward eco-friendly innovations, and this framework created new funding opportunities for environmentally sustainable research (Brogi *et al.*, 2022).

The most relevant sources of the articles published are indicated in Figure 2. It shows the highest number of articles published in the Environmental Science and Pollution Research Journal (64 articles). Environmental Development and Sustainability International Journal and Journal of Business Ethics published ten each. Four articles were published in the Journal of the Academy of Marketing Science. The rest of the journal published articles than three. Notably, these journals are focused on the environment, sustainability, business ethics, and management. Identifying these most relevant sources is important for researchers in the field. These journals are essential for reading and publishing their research; targeting these high-relevance journals increases their study's visibility and impact.

3.2 The Current Knowledge in Green Innovation

Using the minimum keyword occurrences functionality of the VOS viewer software, the total strength of the co-occurrence link with other keywords was calculated for each of the 172 keywords. The keywords with a minimum of two occurrences and in the articles were selected to create the map. There were 15 keywords, including the main keyword, green innovation, and its interrelationships with other keywords are indicated in Figure 3. The line thickness in the figure denotes the strength of the relationship between the keywords. The size of the node denotes the frequency of occurrences. Higher frequency denotes a higher size of the nodes. Thus, "green innovation" can be said it frequently occur in studies. It means this area has been widely researched when compared with other keywords.

Furthermore, the software organizes the items, emphasizing potential sub-areas of research (Turzo et al., 2022). This study identifies five clusters, each represented by different colors in Figure 3: red, green, blue, yellow, and purple. The distinct clusters illustrate how research has varied across different areas of study. Each cluster signifies a unique research topic within the dataset. The findings associated with each theme are detailed below. Keywords in clusters one and two are trending areas anticipated for 2024.

Cluster 1 – Red: The keywords green innovation, environmental regulation, sustainable development, and environmental knowledge belong to this cluster. Green innovation is the most frequently occurring term in this cluster and serves as the central node. Furthermore, it is directly linked to several subthemes,

demonstrating its extensive influence across various research areas. This cluster illustrates how government regulations, sustainability policies, and knowledge dissemination affect green innovation. Additionally, research in this field emphasizes the importance of policies and institutional frameworks in promoting green innovation.

Cluster 2– Green: corporate social responsibility, environmental performance, firm performance, and green transformational leaders. This cluster suggests a strong link between corporate social responsibility and green innovation. Further, studies in this area discover how CSR practices and leadership strategies drive green innovation and sustainability.

Cluster 3 – Blue: institutional pressure, manufacturing industry, and sustainable firm performance. This cluster relates to how industries adapt to environmental policies and stakeholder pressures. Specifically, research focuses on the impact of institutional and regulatory pressures on sustainable business performance.

Cluster 4 – Yellow: Environmental consciousness and Pakistan are included in this cluster. This cluster suggests research examining green innovation in a specific regional or cultural context. The occurrence of "Pakistan" as a keyword suggests localized studies on environmental awareness and sustainability in that region. It means regional and cultural factors are emerging themes in green innovation research

Cluster 5– purple: Environmental degradation and technological innovation fall into this cluster. This cluster signifies the role of technology in addressing environmental challenges. Studies may focus on how innovation can reduce environmental degradation and improve sustainability.

Connections between blue clusters and red clusters indicate that environmental regulations impact industrial sustainability. Connections between green clusters and red clusters suggest that corporate responsibility is influenced by environmental regulations.

Moreover, keyword analysis is examined in depth with Word Cloud analysis. At this point, keywords were analyzed based on their occurrence in each paper. To analyze keywords, "word cloud analysis" was also used. A word cloud analysis is a visual representation of a text, and the words appear bigger the more often they are stated. It is good for visualizing unstructured text and getting insights into trends. As shown in Figure 4, the analysis reveals that the top four most recurrent keywords are green innovation" (9), "Corporate Social Responsibility (4), Environmental Performance (4), and Sustainable Development (3) also the second third, and fourth most used keywords. Accordingly, green innovation is the most dominant term. It indicates it is the central theme. Small words appear less frequently but still contribute to the research domain. Corporate Social Responsibility, Sustainable Development, and Environmental Performance are also prominent. Further, *green innovation* is strongly linked with corporate social responsibility, sustainable development, and environmental performance. Through this word cloud, key themes and research gaps can be identified for further exploration. Further, it indicates major discussion areas and helps to choose keywords when writing or searching for relevant studies.

Figure 5 denotes the number of articles published by each county. The analysis of the most contributing countries aims to identify the geographic distribution of researchers relevant to green innovation. The study includes the analysis of the country of origin of the authors. The diversity of nations engaged in green innovation research is remarkable. From a country viewpoint, many published articles originated in China. These findings align with the existing literature (Rupasinghe *et al.*, 2023; Khan *et al.*, 2021b). The second largest contributing country is the United States of America (see Figure 5). Pakistan has 9 articles, and the United Kingdom has 8 articles. The wide number of articles devoted to green innovations contained in emerging economies, which are often identified by low attention to environmental issues. Notably, among the South Asian countries, there is a rising tendency toward green studies in Pakistan.

Table 3: presents the most highly cited research articles published in journals. Here, the most popular journal in the field was found. Accordingly, the Journal of Business Ethics is the most cited in the field and it includes 10 articles. The second popular journal in the field is the Journal of the Academy of Marketing Science. Environmental science and pollution research international journal has 376 citations with 34 documents.

Citation analysis searches to assess the academic acceptability of research by including the frequency with which studies have been cited in various publications (Khanra *et al.,* 2021; Rupasinghe *et al.*, 2024). Citation analysis measures the popularity of an article among other articles in a sample (Khanra *et al.*, 2021). The relevance of a publication's influence on the field is reflected in the number of times it is cited (Sharma *et al.,* 2022). A co-citation analysis was conducted using cited documents as the unit of analysis. The minimum number of documents for a cited article was considered two (Table 4). A higher number of co-citations means that there is more shared data. These articles were also labelled by their first author's surname. Accordingly, Isabelle Maignan (1999) was the most cited document among selected articles (citations 1069). Lin & Ho, (2011) (citations 352) and Menguc *et al.,* (2009) (citations 306) were the second and third highest cited documents respectively.

3.3 Moderating Variables

3.3.1 Main Moderating Variables and their Meaning

Table 5 presents the main moderating variables and their meaning used by the green innovation and competitive advantage research in past literature. Managerial Environmental Concerns have been used as a moderating variable in the greatest number of the research (Tang *et al.*, 2018; Ar, 2012; Xue, *et al.*, 2019).

3.3.2 Moderating Variables Used in Literature

Figure 6 presents the moderating variables used by the scholars in the previous studies. Among selected articles, most of the studies on green innovation and firm performance used "managerial environmental concern" as the moderating variable in their studies. The second most used moderating variables were organizational culture and green image. No study considers green management, Managerial focus, Board gender diversity, GHRM, and leadership skills as moderating variable. These studies considered structural changes of the organization as the moderating variables in this analysis.

3.4 Unexplored Moderating Factors on Green Innovation and Competitive Advantage

Structural changes

Structural changes refer to differences in the overall arrangement of organizations and are often required to provide support for new operations (Matt *et al.*, 2015). Generally, Structural changes include changes in employees' organizational structure, leadership skills, and organizational culture. In addition to these factors, Khan *et al.*, (2021a) have identified green management, GHRM, Managerial environmental awareness, Managerial focus, and Board gender diversity as structural change factors.

Green management

Green management can be defined as the firm's managerial involvement in addressing environmental issues (Khan *et al.*, 2021a). The basic objectives of green management are both improvement of environmental and business performance. Hence, it should include environmentally-friendly production, green research and development, and green marketing. Green management practices consist of (a) cooperation with supply chain partners, (b) environmentally friendly production (c) internal management support and there is a positive relationship between the adoption of Green management practices and firm performance (Lun, 2011). However, early studies on green management have only focused on the impact of green management but the moderating effect on the relationship between green innovation and firm performance has not been examined.

Managerial Focus

Managerial focus denotes the effort made by an individual to reduce the gap between the current situation and the desired objectives (Khan *et al.*, 2021a). The literature discusses managerial focus as promotion focus and prevention focus (Liao & Long, 2018). Managers with a promotion focus are more willing to take risks and willing to implement new ideas, but managers with a prevention focus don't like to take risks and try to avoid innovative ideas. Further investigation is needed on this factor to provide meaningful insights into the green innovation literature.

Gender Diversity

Men and women differ in their sensitivity to nature and their care for others (Carlson, 1972 cited in Khan *et al.*

2021a). About the environmental issues, female managers are more sensitive to environmental

practices. When compared with men, women may have stronger environmental preferences (McCright, 2010). Literature also suggests female directors had a positive correlation with green innovations (He and Jiang, 2019). Further examination is needed to see how gender diversity acts as a moderating variable in the relationship between environmental innovation activities and firm performance.

Green Human Resource Management

Green HRM is defined as all the activities involved in the development, implementation, and ongoing maintenance of a system that aims at making employees of an organization green (Opatha, 2013). It includes all activities of HRM (recruitment and selection, performance, and compensation, and training and development in a green way). Ogbeibu *et al.,* (2020), revealed that green recruitment and selection, green training, and development, significantly influence green product innovations through green team creativity. Therefore, scholarly attention is needed to understand the moderating effect of GHRM on the relationship between green innovation and firm performance.

Leadership style

Leadership styles are revealed as "a leader's characteristic behaviors or behavioral patterns when directing, guiding and motivating groups of people, influencing in turn followers' behaviors, an answer to a question- how do leaders lead?" (Riva *et al.*, 2021). There are various leadership styles (sustainable, charismatic, transformational, responsible, authentic, entrepreneurial, ethical, and shared leadership) (Piwowar-Sulej & Iqbal, 2023), and among them, transformational leaders positively impact GHR practices (Singh *et al.,* 2020). The findings of the study show a positive effect of green knowledge and green transformational leadership on green creativity and green transformational leadership on environmental performance. (Riva *et al.*, 2021). The study of Riva, Magrizos, and Rubel (2021) synthesizes how leadership affects sustainable performance directly or indirectly and reveals that there is no established consensus regarding empirical evidence. Therefore, the concept of leadership is yet to be explored enough in the relationship between green innovation and firm performance.

Green Organizational Capabilities

Green Organizational Capabilities are the “collective abilities of enterprises strategically aligning their independent resources to achieve environmental protection objectives” (Nguyen *et al.*, 2023). It includes green motives and Technological readiness.

Green motives

Early studies propose that three different green motives drive a company to stimulate green activities: instrumental motives, moral motives, and relational motives (Paulraj *et al.,* 2017). With Instrumental motives, managers are self-interested and reduce costs and wastage by implementing green practices. With relational motives, managers are concerned with various stakeholders. Moral motives are connected with ethical standards and moral principles. With moral motives, a firm's integrity can go beyond laws and regulations to support green practices (Chang, 2019). Some studies found that instrumental and moral motives have positive effects on green product innovation performance (Chang, 2019). Literature has discussed these three motives and their impact on green practices. Nevertheless, empirical studies on their moderating impact on green innovation and firm performance are missing.

Technological readiness

Technology readiness denotes the smoothness with which an organization adopts new technologies and integrates them into the organization's production process (Zhang *et al.,* 2020b). The value of environmentally friendly technology is determined by how the organization adapts to the firm. Intergrading environmentally friendly technology smoothly to the firm easily can implement green innovations. Consequences of it firm can gain a competitive advantage. While the literature is clear that the implementation of green innovation relies on technology readiness, empirical studies on their moderating impact on green innovation firm performance are omitted.

Figure 7 presents the possible moderating factors indicated above on Green Innovation and Competitive Advantage. Table 6 present possible research questions for proposed moderating variables based on above discussion.

4. Conclusion

The objective of the present study was to provide a comprehensive analysis of existing knowledge on green innovation and competitive advantage, summarize the various moderating factors identified in

review articles, and discuss potential moderating factors that could be explored in future research.

This study on the current state of green innovation and its moderating factors makes a multifaceted contribution to the literature. Initially, this study organizes existing studies on green innovation based on annual scientific production and journal-wise distribution. Furthermore, to achieve the objective, the study employed techniques such as keyword co-occurrence network visualization, co-citation analysis, word cloud analysis, country of study, and citation analysis, providing a comprehensive understanding of the research area. Conducting a comprehensive analysis of keywords from selected studies, including visualizing keyword co-occurrence networks and performing word cloud analysis, helps identify gaps in the green innovation literature.

At the next point, the main moderating variables and their meaning with sources were summarized, and it has categorized the moderating variables in literature into several themes, making it easier to visualize the various aspects of moderating variables. Structural changes, green management, managerial focus, gender diversity, GHRM, leadership style, green motives, and technological readiness are identified as potential moderating variables for future research. Some possible research questions for proposed moderating variables are presented. Based on these factors, different theoretical and logical arguments can be built, and it will aid in shedding a new light on green innovation in the future.

5. Research Implications

Theoretical Implications

This study provides three key theoretical implications. First, to our knowledge, no studies have explored the moderating factors of green innovation and competitive advantage. This study aims to address this gap by offering a platform for scholars to contribute to this under-examined area.

Second, this comprehensive analysis seeks to provide a complete picture of the various aspects of the moderating factors related to green innovation and competitive advantage research. This systematic literature review (SLR) can assist scholars in broadening their studies by adding more insights into the green innovation literature.

Third, the current study identifies various gaps in the selected studies and presents possible research questions (see Table 6) to address these gaps.

Practical Implications

This study provides a comprehensive analysis of the moderating factors influencing green innovation and competitive advantage, benefiting researchers, organizations, and practitioners. The field of green innovation offers a solid understanding of the concept and its development. Furthermore, it serves as guidance for those interested in entering the green innovation arena by providing information on relevant journals and articles. Researchers are encouraged to utilize this study to develop green innovation concepts and competitive advantages by incorporating additional moderating variables and creating new theoretical integrations.

For practitioners, this review emphasizes that various moderating variables can enhance the relationship between green innovation and competitive advantage. Consequently, managers can leverage this knowledge within their organizations.

4. Directions for future research and limitations

The findings of this study suggest many opportunities for future researchers in the field of green innovation. Specifically, the findings indicate potential moderating factors between green innovation and competitive advantages that have not been examined yet. Need more discussion on structural changes of the organizations (green management, GHRM, Managerial environmental awareness, Managerial focus, Board gender diversity, Green Human Resource Management, Leadership Style) and Green Organizational Capabilities (Green motives, Technological readiness).

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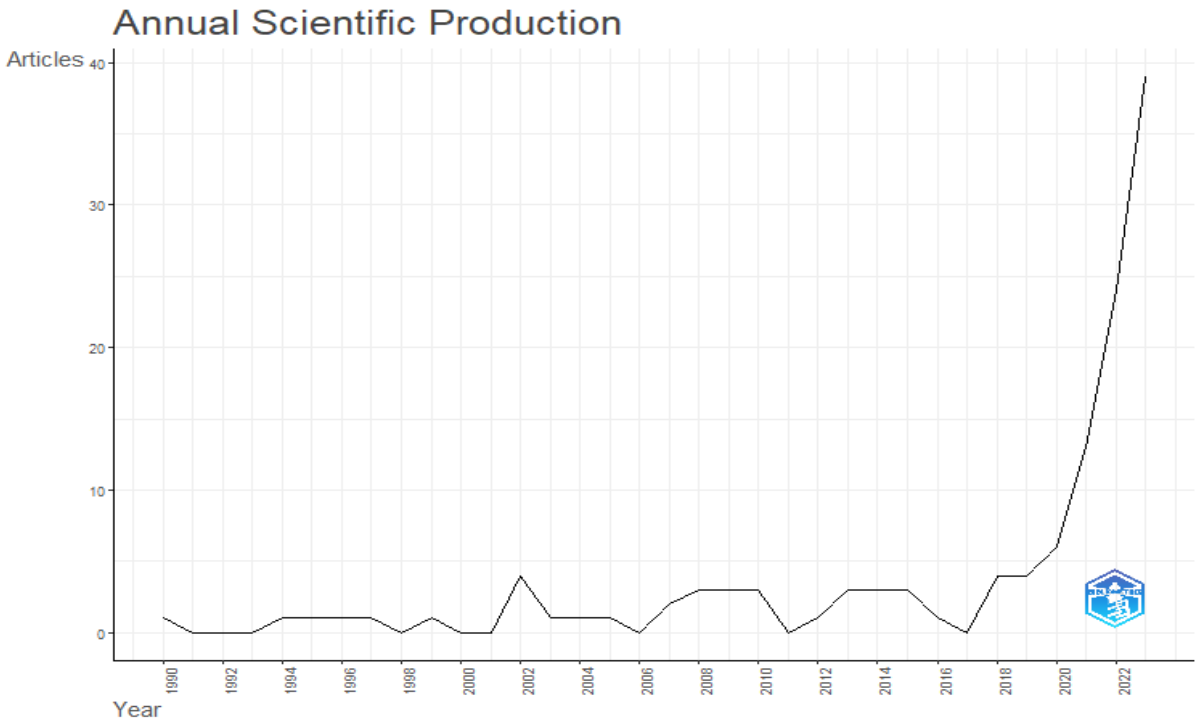
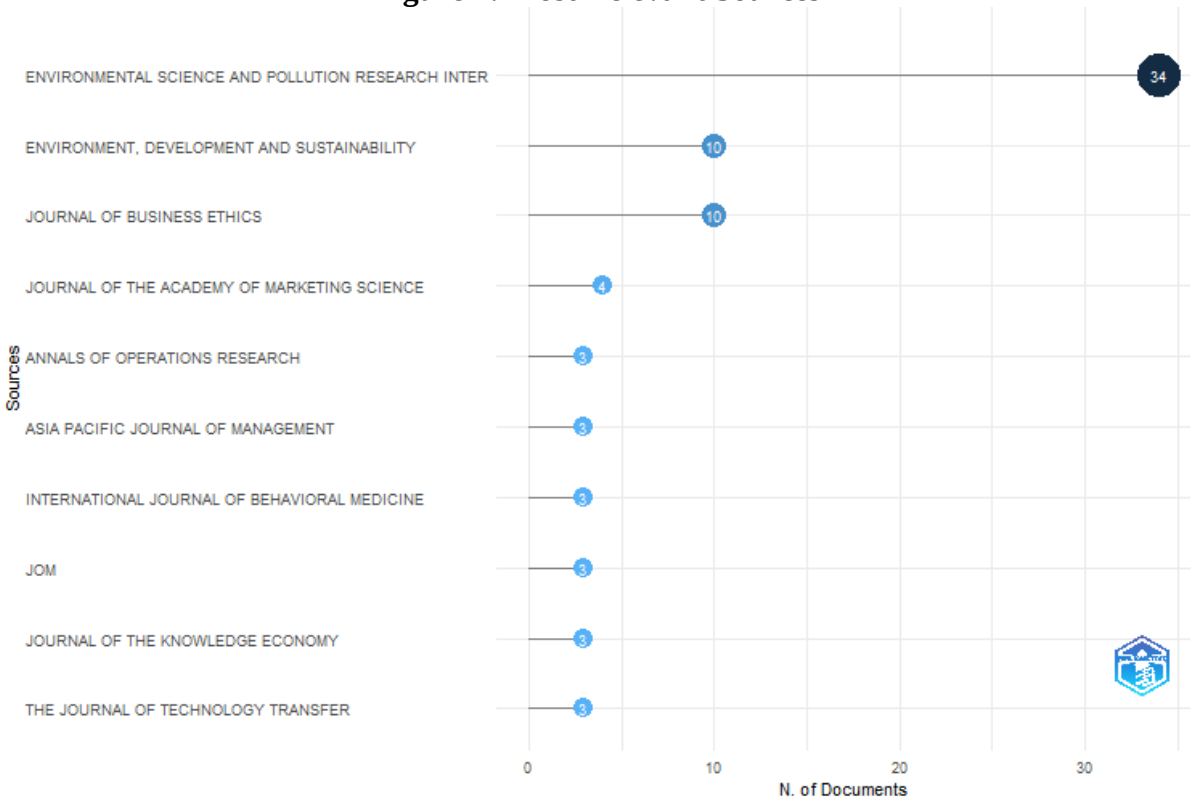
The main limitation of the study is that articles published in journals contained within a lens org. database. Utilizing other more commonly used databases could have discovered more articles and provided broader insights into the field of green innovation. After the economic crisis of Sri Lanka, the academic community doesn't have access to other popular databases like Scopus, Science Direct etc . Secondly, when we used the recently published articles, the number of citations was not available for them. Therefore, it is essential to consider this information in future research.

Figure 1: Annual Scientific Production



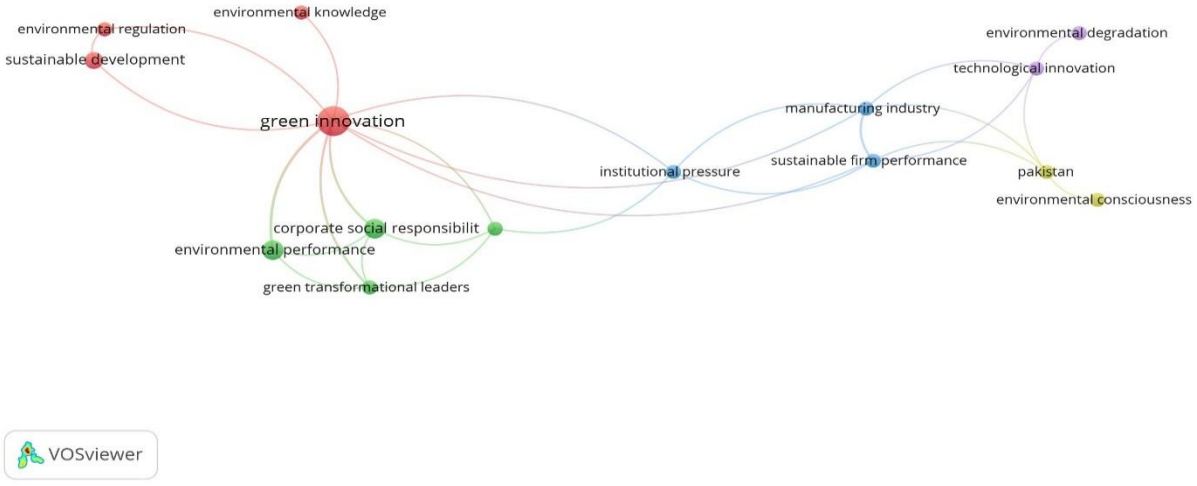
Source: Biblioshiny Software,(2024)

Figure 2: Most Relevant Sources



Source: :(Biblioshiny Software,2024)

Figure 3: The keyword co-occurrence network visualization

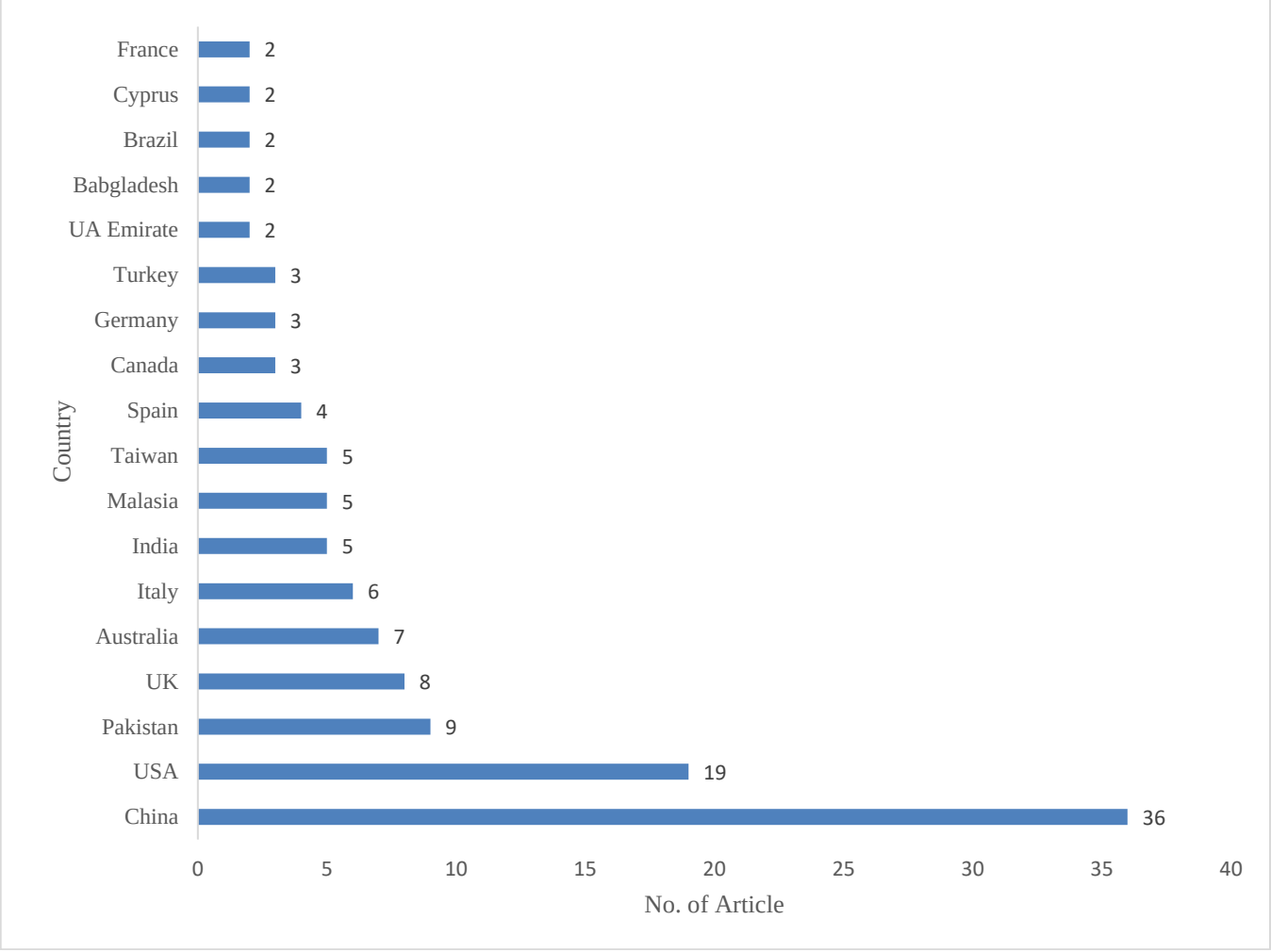


Source: :(VOS viewer Software,2024)

Figure 4: The Word Cloud of Green Innovation

Source: :(VOS viewer Software,2024)

Figure 5: Counties Contributing to Green Innovation Literature



Source: Authors' conception

Table 3: Top 15 Journals in Terms of Citations

Source	Documents	Citation
Journal of Business Ethics	10	1523
Journal of the Academy of Marketing Science	4	1402
Environmental Science and Pollution Research International Journal	34	376
Small Business Economics	2	237
Annuals of Operations Research	3	120
Asia Pacific Journal of Management	3	102
Global Journal of Flexible Systems Management	2	31
Journal of Technology Transfer	3	26
Environment, Development and Sustainability	10	20
Technology in Society	2	15
International Journal of Behavioural Medicine	3	11
Quality of Life Research	2	11
Asian Business & Management	2	6
Journal of the Knowledge Economy	3	4
Journal of Management	3	2

Source: :(VOS viewer Software,2024)

Table 4: Citation Analysis Based on the Documents

Document	Citations
Isabelle maignan (1999)	1069
Lin C.Y. (2011)	352
Bulent Menguc(2009)	306
Robet C.Padgett(2009)	272
Jeffrey b.Schmidt(2002)	225
Kevin Ibeh(2003)	196
defeng yang (2018)	181
Colin C.J. Cheng (2018)	115
Jaepil Choi(2007)	110
Devon S Johnson(2005)	108
luka andrić (2008)	84
sheshadri chatterjee (2021)	82
Pramadita Sharma (2013)	73
kenneth l. kraft (1990)	72
Abraham Carmeli (2008)	71
Michael Jay Polonsky (2002)	69
yadong liu (2021)	66
Mohammad Waqas(2021)	60
zareen arslan (2021)	48
mansour naser alraja (2022)	42
Muddassar Sarfraz(2020)	41
yang li (2002)	41
emilio galdeano-gómez (2007)	37
kirti nayal (2021)	36
Fazal Hussain awan(2022)	29
dhekra ben amara (2020)	29
chengli shu (2019)	29
mubeen abdur rehman (2022)	28
Ioannis ionnou(2022)	27
xiude chen (2021)	23
sanjay k. arora (2019)	22
amit gupta (2021)	21
zeye zhang (2022)	19
Opurbo Sarkar(2020)	19
Muhammad waqas(2021)	18
Amit saini (2008)	17
demosthenes akoumianakis (2010)	16
anne heider (2022)	14
shafique ur rehman (2023)	13
Marta herezniak(2020)	11
Lara bartocci liboni(2022)	11
Naila nureen (2023)	11
lourdes moreno-mondéjar (2020)	10
jyoti s. a. bhat (2010)	10
nancy a. pachana (2009)	10
Farid ullah(2021)	10

Source: :(VOS viewer Software, 2024)

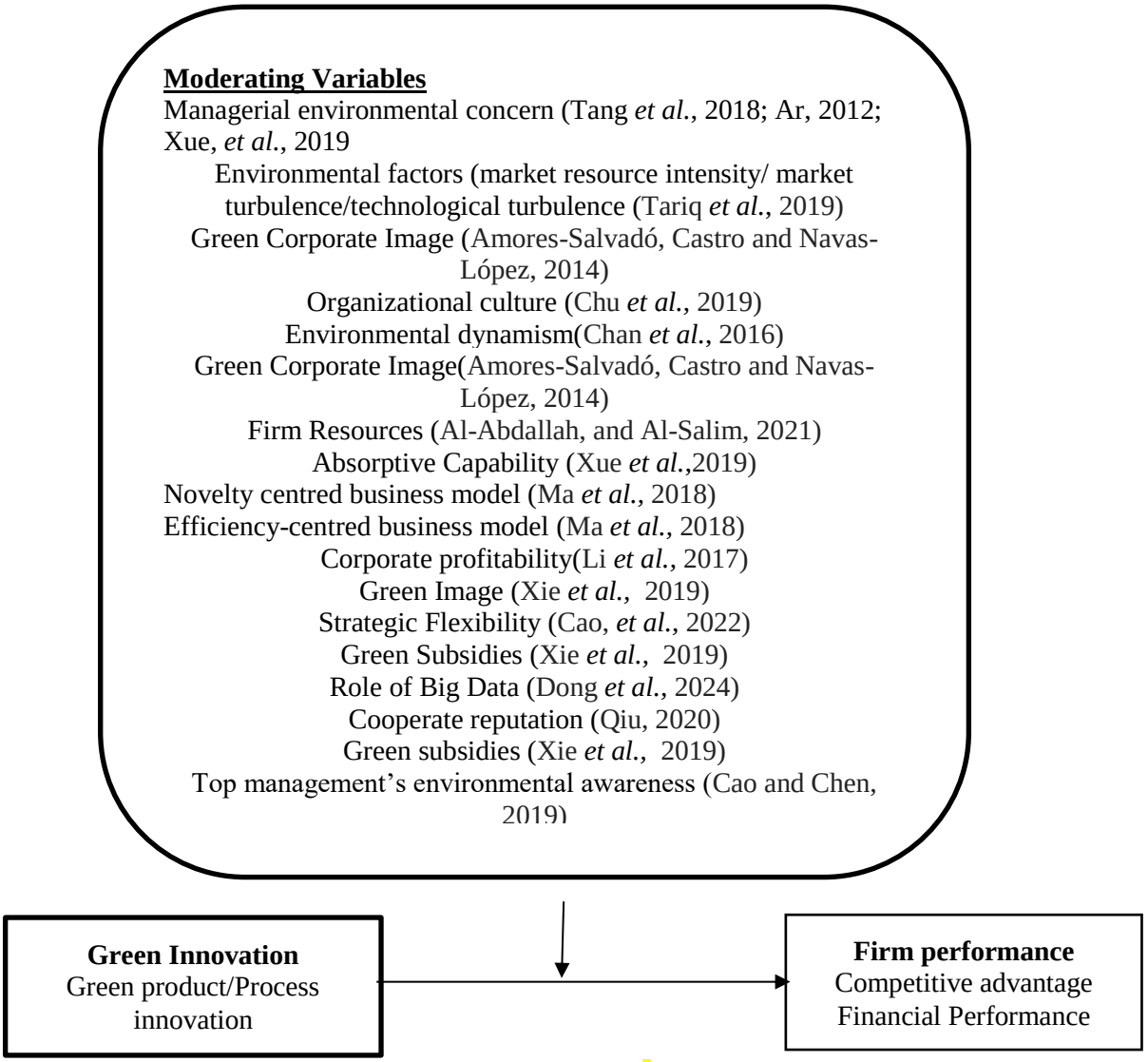
Table 5: Main Moderating Variables and their Meaning

Moderating Variable/s	Meaning	source
Managerial environmental concern	Managers are more concerned about green issues.	Tang *et al.*, 2018; Ar, 2012; Xue, *et al.*, 2019
-Environmental factors (market resource intensity/ market turbulence) -technological turbulence	The extent to which a firm invests in drawing customer attention toward its strategy.	Tariq *et al.*, 2019
Organizational Culture	A set of beliefs, values, and assumptions shared by members of an organization.	Chu *et al.*, 2019
Environmental dynamism	Change technologies, variations in customer- preferences, and fluctuations in product demand or supply of materials	Chan *et al.*, 2016
top management's environmental awareness	Characteristics of top management's attitudes and values toward different environmental strategies.	Cao and Chen, 2019
Corporate profitability	Whether an organization's behavior is appropriate within certain social Systems.	Li *et al.*, 2017
Green Corporate Image	Environmental or green-related features of the firm that stakeholders come to perceive (Amores-Salvadó, Castro and Navas-López, 2014)	Amores-Salvadó, Castro and Navas-López, 2014
Firm Resources	All assets, capabilities, attributes, information, and knowledge controlled by the organization that enables it to conceive and implement advanced business strategies.	Al-Abdallah, and Al-Salim, 2021
Managerial environmental concern	Values, beliefs and norms determine willingness for eco-innovation adoption.	Ar, 2012
Managerial Environmental Concern/ Absorptive Capability	To be more proactive on environmental issues (e.g., environmental rules and regulations) and proffer innovative measures in developing green innovation activities.	Xue *et al.*,2019.
Environmental dynamism	Environmental dynamism is concerned with the extent to which external environments are characterized by "change in technologies, variations in customer preferences, and fluctuations in product demand or supply of materials"	Chan, *et al.* 2016
Novelty-centered business model	novelty-centered design theme concentrates on introducing new transaction methods or connecting with new transaction partners.	Ma *et al.*, 2018

Efficiency-centered business mode	Efficiency-centered design theme focuses on transaction efficiency and transaction cost as the business model got involved	
Green image	The desired general impression of the firm in the minds of its key stakeholders (Xie *et al.*, 2019)	Xie *et al.*, 2019
Green subsidies	Subsidies that manufacturing industries receive from the government to fund or aid their environmental practices.	
Strategic flexibility	Making the organization more adaptable to the outside.	Cao, *et al.*, 2022
Role of big data	The datasets are diverse, complex, and of a massive scale.	Dong *et al.*, 2024
Corporate reputation	Complex and the main driver of reputation creation is embedded within the company.	Qiu, 2020

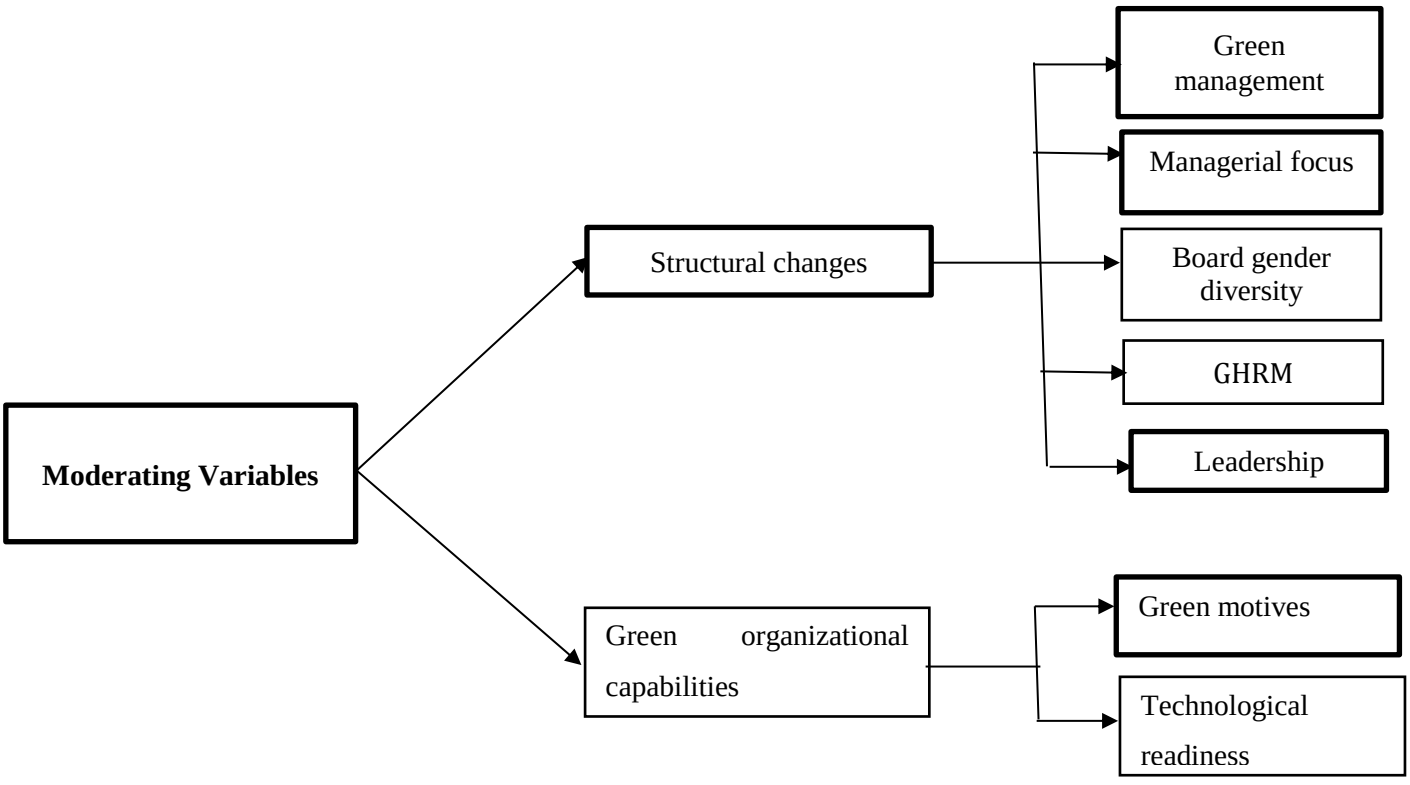
Source:(Developed by Authors based on Literature, 2024)

Figure 6: The Integration of Moderating Variables Used in Literature.



Source: (Developed by Authors based on Literature, 2024)

Figure 7: Possible Moderating Factors on Green Innovation and Competitive Advantage



Source: (Developed by Authors, 2024)

Table 6: Possible Research Questions for proposed Moderating Variables

Theme	Possible Research Questions
Green management	Does green management act as a moderator in the relationship between green innovation and firm performance?
Managerial focus	Do promotion-focus managers moderate the relationship between green innovation and firm performance? Do prevention-focus managers moderate the relationship between green innovation and firm performance?
Board gender diversity	How does gender diversity act as a moderating variable in the relationship between green innovation activities and firm performance?
GHRM	Does GHRM act as a moderator in the relationship between green innovation and firm performance?
Leadership	Does leadership style moderate the relationship between green innovation and firm performance?
Technological readiness	Does Technological readiness moderate the relationship between green innovation and firm performance?

Source: (Developed by Authors, 2024)

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