

Systematic Literature Review: On Green Innovation

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ABSTRACT

Green innovations (GI) help reduce the negative impact on the environment. Because of their dynamic activities and resulting in more economic performance, customers are willing to pay the premium price for environmental health products. Hence, GI is an important tool for businesses to increase their market share and sustainability. The objective of this article is to identify research gaps in green Innovation and to discuss future implications. This study used the systematic literature review (SLR) methodology and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Following the predetermined inclusion criteria, 60 articles from the Google Scholar and lens.org databases, were included for review as the findings research gaps were identified namely theoretical gaps, thematic area gaps (empirical gaps) contextual gaps, and methodological gaps. Further, it provides some theoretical and future research implications. This study contributes to the body of knowledge on green innovation by addressing significant knowledge gaps. This knowledge contributes to future researchers designing and carrying out a study to fill these identified research gaps and practitioners who need to benefit from an understanding of the different aspects of GI.

Keywords: green innovation, research gaps, systematic literature review

I. INTRODUCTION

Environmental degradation may become one of the most severe pressures on people's survival in the world. Some organizations understand green innovations as an approach to achieve both ecological consideration and financial growth of their organizations. Further, GI has become an important tool for businesses to increase their market share and sustainability. A successful GI improvement increases market position, attracts customers, and gains a competitive advantage (Chu et al., 2019). Thus, cultivating a green culture helps firms achieve competitive advantage and society achieve environmental sustainability. Green innovation is the novel or improved products and processes, managerial, including technology, and organizational innovations that help sustain the surrounding environment (Weng et al., 2015; Ilvitskaya & Prihodko, 2018). Further, green innovation is defined as software or hardware innovation related to processes or green products (Chen et al., 2006).

However, there are not enough empirical and theoretical arguments in the field of green innovations, and it is still an emerging field. Especially in the Sri Lankan context, only a few studies were done by the scholars (Somarathna, 2020). Therefore, the authors intended to write this article with the objective of identifying research gaps in green Innovation and discussing future implications. The major contributions of this article to the literature on green innovation are mainly four research gaps identified as future avenues in GI research. Second, the study provides valuable insights for managers to cultivate an organization's green culture.

This study is organized into seven sections: Section one is a preliminary introduction. Section two focuses on the adapted method and methodology. Section three focuses on analysis, and Section four presents the discussion. Section five is about the future implications of GI, and sections six and seven illustrate the conclusion and references.

II. ADAPTED METHOD AND METHODOLOGY OF THE STUDY

To address the research objectives, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram was used. It consists of three steps: "identification, screening, and inclusion," which is shown in the following Figure 1. The PRISMA is highly recommended for SLRs (systematic Literature Reviews) since it helps to prevent bias in article selection, analysis, and reporting of the findings (Priyashantha et al., 2022). The identification stage includes choosing search terms and criteria. Accordingly, "green innovation" was the search term and criteria. Since this article focuses on green innovation, researchers did not consider other similar terms as search criteria. The article screening stage included automatic and manual screening. At this point, the inclusion criteria were applied to include the articles (see Table 1).

Table 1: Article inclusion criteria

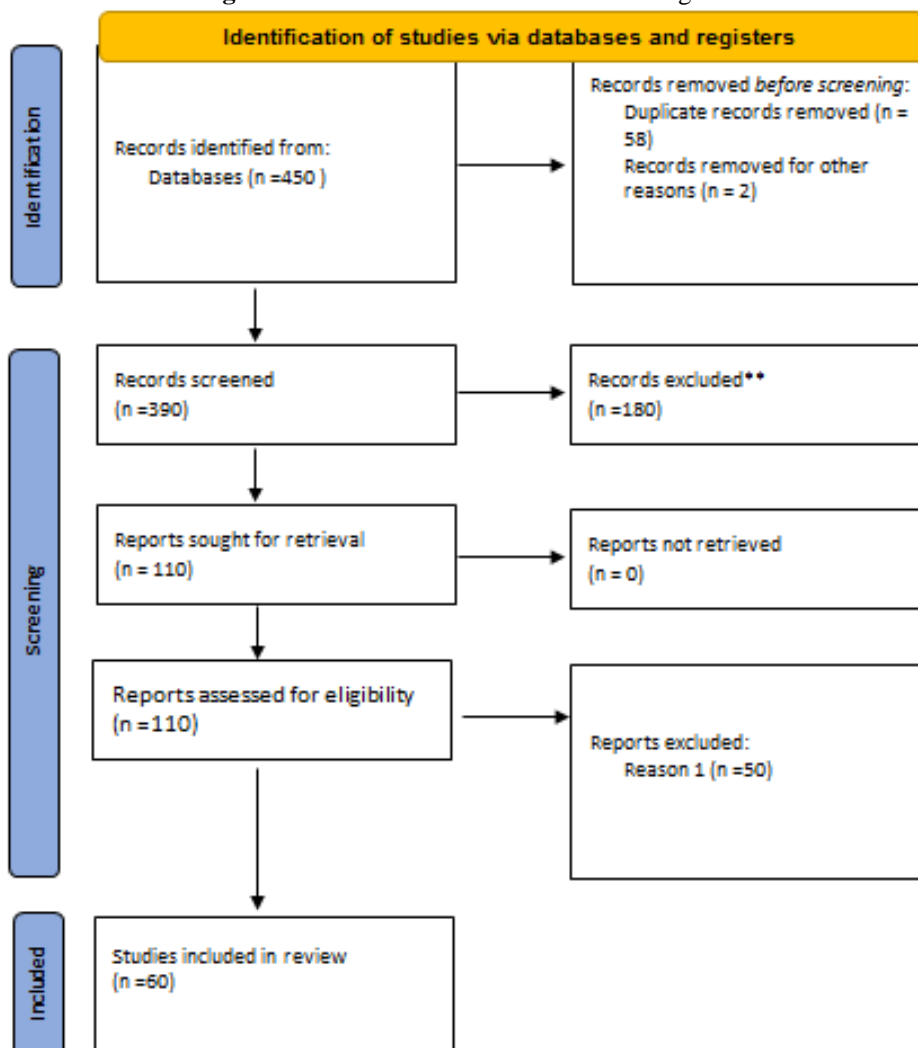
Inclusion criterion	Focus on
1	publications from 2018–2022
2	the articles in the English language
3	publications with the keyword “green innovation”
4	publications as articles
5	journal and conference articles

Source: Authors’ conception

Articles were found in databases such as Google Scholar and Lens.org. Researchers selected these two databases because of their easy access and the free access to peer-reviewed articles available in them. These journal articles have good quality and are treated as reliable since they undergo a peer-review procedure. It had generated 450 articles at this point. At the identification stage, out of the 450 articles, 58 were rejected as duplicates, and two were rejected on the grounds that they were not directly relevant to the field of green innovation. After that, the remaining articles’ (390) abstracts were downloaded and assessed against the inclusion criteria. At this point, 180 articles were excluded because they did not meet the aforementioned inclusion criteria in Table 1. In terms of the time frame, after 2018, scholars have more focus on green innovation than earlier since people have been concerned about the environment in their buying decisions and organizations have been concerned about competitive decisions. Because of this point, articles were reviewed from 2018 to 2022.

Then, the full version of the 110 articles was screened against exclusion criteria. As the exclusion criteria, methodological reporting was evaluated. As a consequence, 50 articles were rejected based on low quality. Finally, 60 articles were retained for review, as shown in Figure 1.

Figure 1: PRISMA article selection flow diagram



Source: Review data, 2023

III. ANALYSIS

3.1 Key Studies on Green Innovation

Key studies on green innovation by various scholars from 2018 to 2022 were examined to understand the different aspects studied. These studies were journal articles and conference proceedings at the international and local levels. A summary of such studies is presented in Table 2.

Table 2: Key Studies on Green Innovation

Focus Area	Sources
Green innovation strategy	Soewarno et al., (2018); Skordoulis et al., (2022)
Firm performance/Competitive advantage	Ge et al., (2018); Famiyeh et al., (2018); Guimaraes et al., (2018); Lukitaruna & Sedianingsih (2018); Turulja & Bajgoric (2018); Tariq et al., (2019); Qiu et al., (2019); Juniati et al., (2019); Xue et al., (2019); Zhang et al., (2019); Xie et al., (2019); Ghaith et al., (2020); Asadi et al., (2020); Sellitto et al., (2020); Tjahjadi et al., (2020); Zameer et al., (2020); Somarathna, (2020); Su et al.,(2020); Nasrollahi et al., (2020); Karabulut & Hatipoğlu (2020); Novitasari & Agustia (2021); Cao et al., (2021); Singh et al., (2021); Wang et al., (2021); Dong et al., (2022); Kuo et al.,(2022)
Drivers for green innovation	Mady et al., (2021); Cai & Li (2018)
Determinants of green innovation intentions	Jun et al.,(2019); Zhang et al., (2020); Hossain et al., (2020)
Environmental orientation	Feng et al.,(2018); Muangmee et al., (2021)
Green culture	Wang, (2019); Widiyati & Murwaningsari (2021)
Stakeholders pressure	Feng & Chen (2018); Shubham et al., (2018); Cao & Chen (2018); Chu et al.,(2019); Zhang & Zhu (2019); Wang et al.,(2021); Singh et al., (2022); Huang et al., (2022)
Green entrepreneurial orientation	Feng et al., (2018), Guo et al., (2020); Fatoki, (2021)
Model on green innovation	Yusr et al., (2020); Ma et al., (2018)
Environmental practices/Green innovation practices	Yousaf, (2021); Wang & Yang (2021)
Obstacles to green innovation	Chien et al., (2021)
Literature review on green innovation	Khan et al., (2021); Khanra et al., (2021); Takalo (2021); Oduro et al.,(2021); Li et al., (2022); Seman et al., (2019)
Intention to use green innovation	Shantha, (2019)

Source: Developed by the researchers based on literature

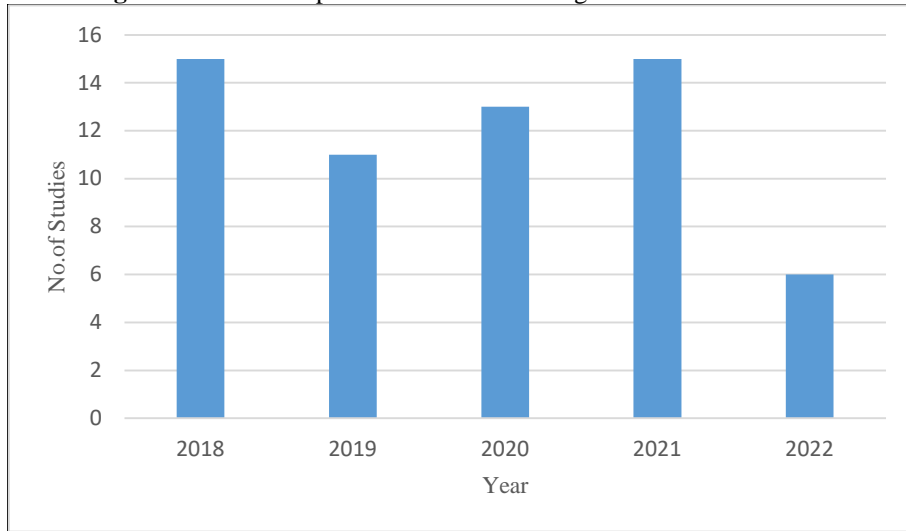
According to Table 2, there were 60 research studies with regard to green innovation that were referred to by the researchers in this study. Some studies were conceptual, while others were empirical. Empirically studied were basically green innovation strategy, firm performance or competitive advantage, drivers for green innovation, factors influencing the adoption of green innovation, determinants of green innovation Intentions, impacts of dimensions of environmental orientation, green culture, stakeholder pressure, green entrepreneurial orientation, a model of green innovation, environmental practices or green innovation practices, obstacles to green innovation or sustainable development dilemmas, and the intention to use green innovation. Aspects conceptually studied were with regard to an overview of the existing body of literature on eco-innovations, green innovation, and what green innovation is. Past, present, and future of green product innovation and green innovation: a multi-domain systematic review

Among review articles, the majority discussed firm performance. Under firm performance, a relationship between green innovation and financial/economic performance or competitive advantage has been found. The second most discussed topic was stakeholders in green innovation and pressure from different stakeholders, i.e., customers, government, and competitors. Only one article among the reviewed data has introduced a "model" for green innovation.

3.2 Analysis of the Year-Wise Publications of Relevant Green Innovation Studies

Figure 2 depicts the recent trend of studies that have been conducted within the field of green innovation. Accordingly, it is obvious that the majority of studies have been conducted in the years 2018 and 2021, while fewer studies in the year 2022 relate to green innovation. It implies that there has been a growing trend in recent years concerning green innovation compared to earlier.

Figure 2: Year-wise publications of relevant green innovation studies



Source(s): Review Data, 2023

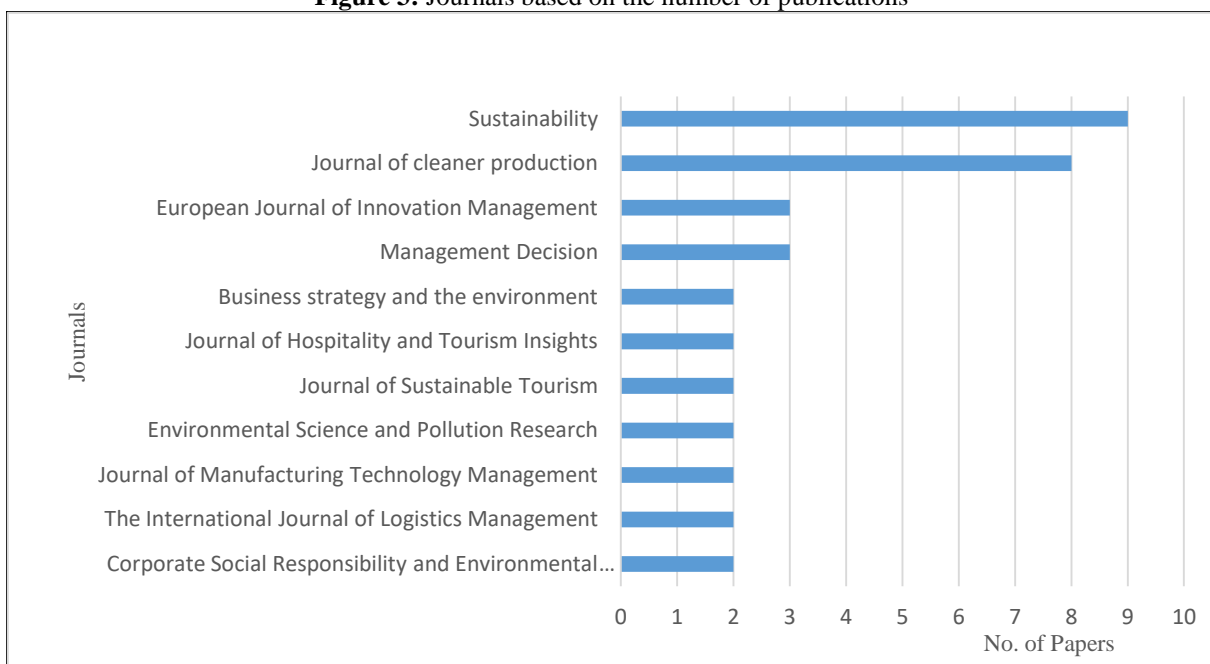
3.4 Distribution of Papers Across Journals

Figure 3 presents the names of the publications where the reviewed studies have been published. According to Figure 3, the highest number of papers is available in the Journal of Sustainability. Additionally, the second-highest number of papers (8 papers) is available in the Journal of Cleaner Production. In addition to that, Management Decision and the European Journal of Innovation Management have the third-highest number of studies (three papers). The last sets of articles are also available in recognized journals, with two articles in each.

3.5 The Theoretical Underpinnings of the Relevant Green Innovation Studies

Figure 4 presents the theoretical underpinnings of the relevant green Innovation studies, and most studies apply the resource-based view for their studies. The second most applied theory is the stakeholder theory, and two studies apply the resource dependence theory to their studies. Other theories that apply to one study include organizational identity theory, Upper echelons theory, organizational legitimacy theory, the Natural resource-based view, Contingency theory, The Theory of systematic interduality, Acceptance, behavioural theories, Business model theory, Kybernetes, and organizational learning theory.

Figure 3: Journals based on the number of publications



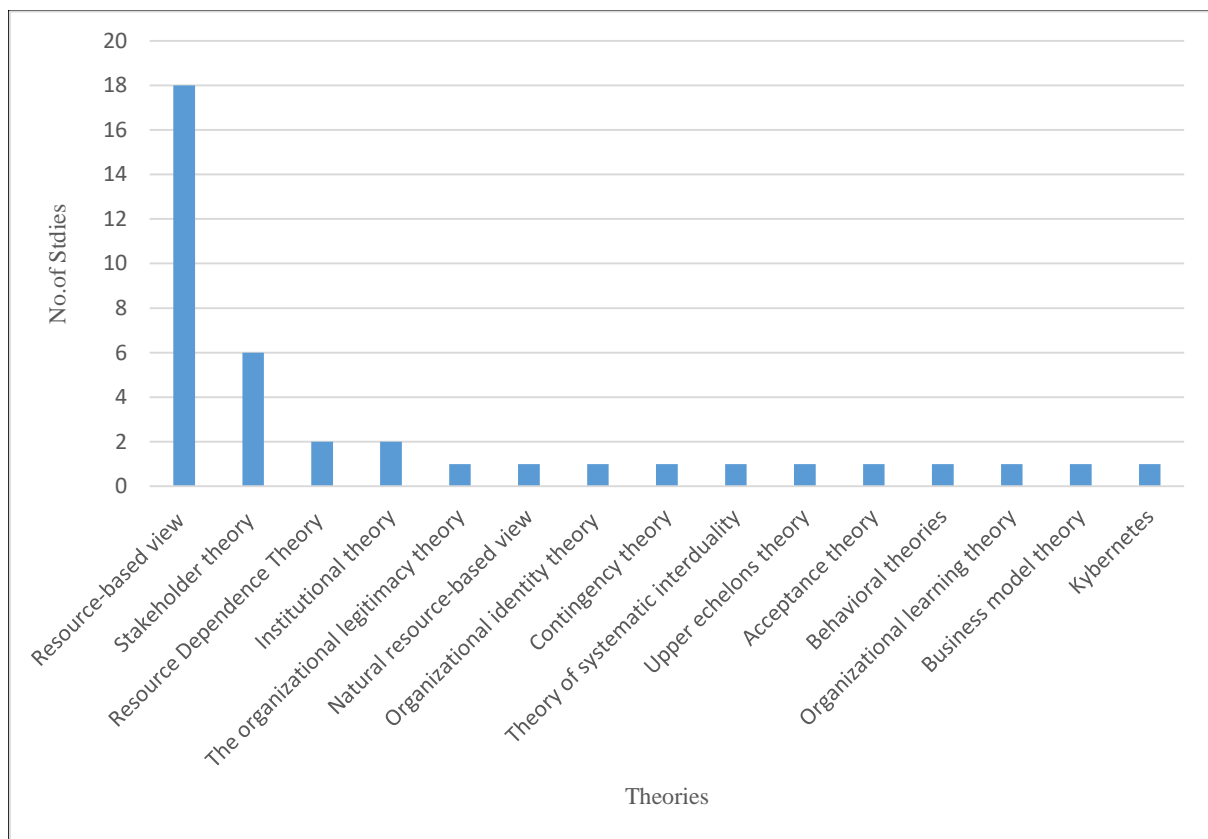
Source(s): Review Data, 2023

Note: Other journals that published one article each include the Journal of Manufacturing Technology Management Journal of Industrial Engineering and Management, Journal of Knowledge Management, Environment, Development, and Sustainability, EuroMed Journal of Business, Frontiers Psychology, Journal of Business Research, Social science, Sustainable Futures, Nankai Business Review International, Benchmarking: An International Journal, Journal of Manufacturing Technology Management, International Journal of Research, International Journal of Supply Chain Management, Resources, Conservation & Recycling, The Service Industries Journal, Technology analysis & strategic management, International Journal of Commerce and Finance, Management Research Review, Journal Open Innovation, Journal of Business Research.

3.6 Theme-Based Segregation of Relevant Green Innovation Studies

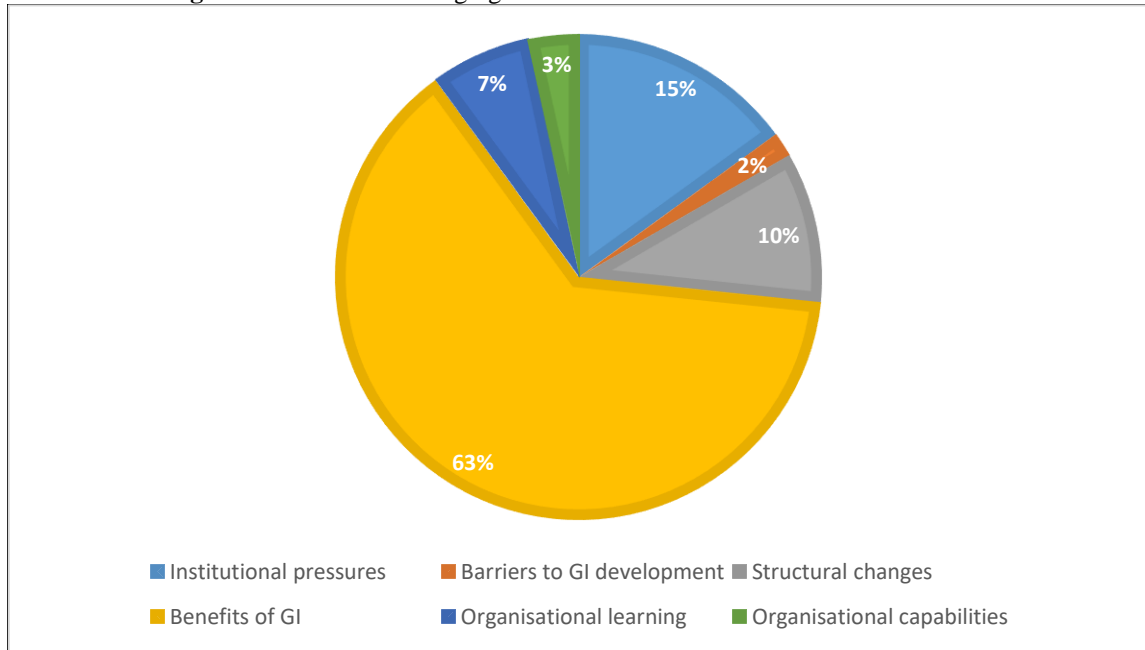
Based on the recently published study by Khan et al., (2021), the themes of the study are divided into six categories: Institutional pressure, Barriers to green innovation development, Structural changes, Benefits of green innovation, organizational learning, and organizational capabilities. Figure 5 presents the theme-based segregation of the relevant green innovation studies, and 63% of the studies among the reviewed articles have discussed the benefits of green innovation. Under the benefits of green innovation, firm performance, firm value, and competitive advantage have been studied. The second most discussed theme was structural changes (10%), and under it, green management, and managerial environmental awareness have been discussed. Barriers to green innovation development have been discussed in only 3% of the studies.

Figure 4: Theoretical underpinnings of the relevant Green Innovation studies



Source(s): Review Data, 2023

Figure 5: Theme-based Segregation of the relevant Green Innovation Studies

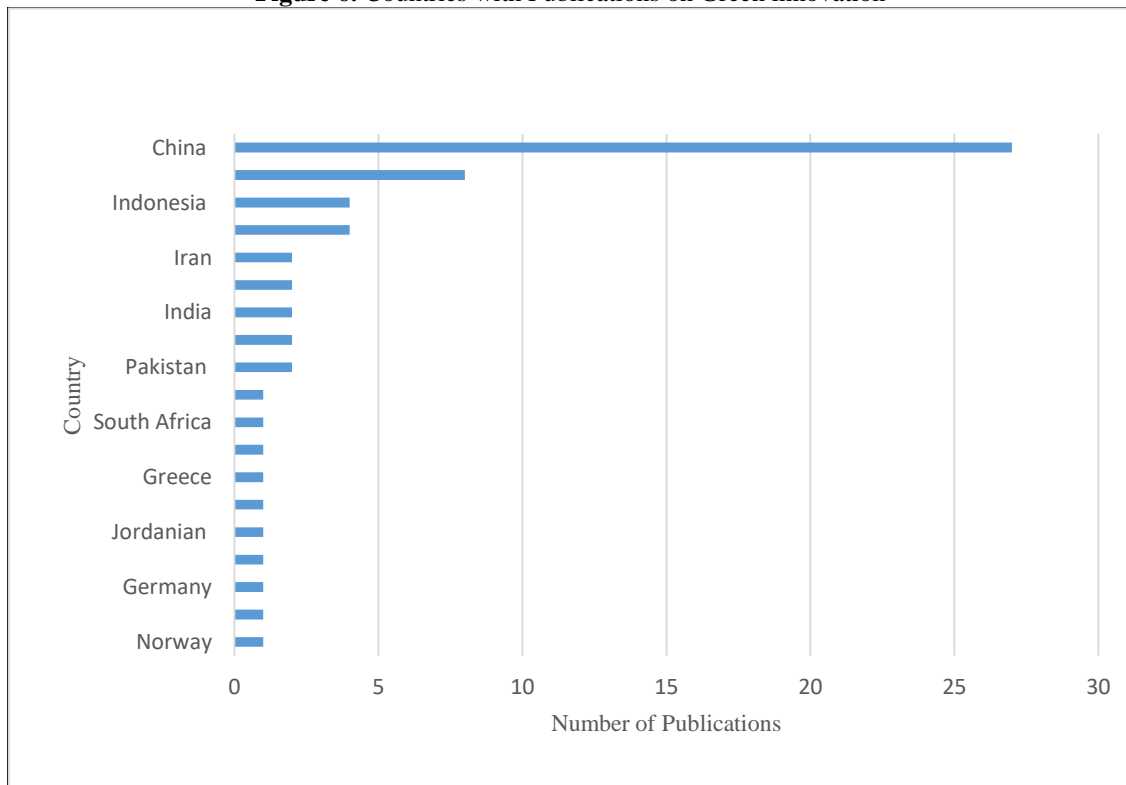


Source(s): Review Data, 2023

3.7 Countries with Publications on Green Innovation

Figure 6 presents the number of publications that have been conducted in various countries. Most Publications were done in China; Malaysia is the second-most conducted country. Indonesia and Malaysia are the third-highest countries. Accordingly, Pakistan has four studies, India has two studies, Sri Lanka has only one study, among the South Asian countries, and some other South Asian countries (Bangladesh, Bhutan, Nepal, Maldives, and Afghanistan,) don't have a single study. Notably, there is a rising tendency toward green studies in Southeast Asian countries (Malaysia, Thailand, and Indonesia).

Figure 6. Countries with Publications on Green innovation



Source(s): Review Data, 2023

3.8 Research Method Displayed in Relevant Green Innovation Studies

The selected studies (N =60) in this review have analyzed green innovation from different perspectives and have investigated various aspects of them. Each study's in-depth review and content analysis was conducted to synthesize these studies. Based on the methodology applied, studied papers were categorized into three basic groups: Literature Reviews, Qualitative, and Quantitative. As Table 3 shows, 46 studies, are quantitative. It included three different categories; survey questionnaire, e-mail, and semi-structured interview. As the main research methodology, quantitative research has been applied to survey questionnaires widely in 42 studies. E-mail has been applied in three studies and semi-structured interview methods were applied in only one study. Concerning the data collection methodology in qualitative studies, In-depth interviews have been applied in three articles and content analysis, case studies, discourse analyses, and Fuzzy set theory have been done in one paper each. Finally, six papers include 03 Systematic literature reviews, 03 Literature reviews, and 01 comprehensive literature review.

Table 3: Research Method displayed relevant green innovation studies

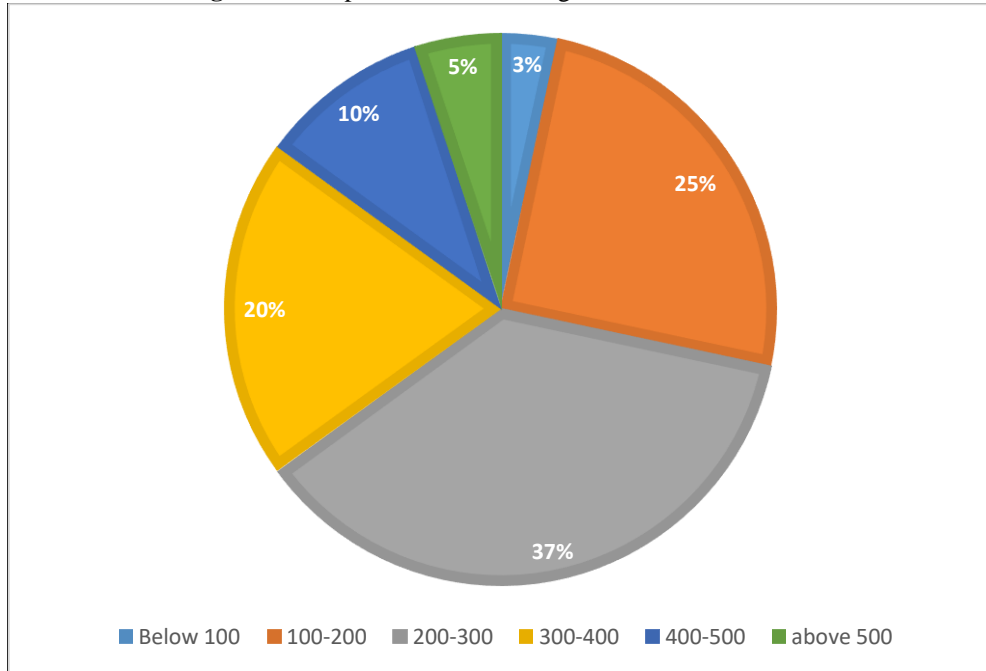
Method	Data collection technique	Source
Quantitative	1.Survey Questioner	Soewarno et al., (2018); Shubham et al., (2018); Lukitaruna & Sedianingsih (2018); Ge, (2018); Famiyeh et al., (2018); Ma, (2018); Feng & Chen (2018); Cao & Chen(2018); Tariq et al., (2019); Qiu et al., (2019); Juniati et al., (2019); Jun et al., (2019); Zhang & Zhu (2019); Xue et al., (2019); Zhang et al. (2019); Wang, (2019); Xie et al. (2019); Zhang et al., (2020); Yusr et al., (2020); Asadi et al., (2020); Sellitto et al., (2020); Ghaith et al., (2020); Tjahjadi et al., (2020); Hossain et al.,(2020); Zameer et al.,(2020); Guo et al., (2020); Su et al., (2020); Yusr et al., (2020); Singh et al., (2021); Widiyati & Murwaningsari (2021); Cao et al., (2021); Mady et al., (2021); Fatoki (2021); Yousaf, (2021); Wang et al., (2021); Muangmee et al., (2021); Novitasari & Agustia (2021); Wang et al., (2021); Skordoulis, (2022); Dong, (2022); Kuo & LePage (2022); Singh et al., (2022); Huang et al.,(2022) Guimaraes et al., (2018); Feng et al.,(2018); Nasrollahi et al., (2020) Chu et al.,(2019)
	2.E-mail	
	3.semi-structured interview	
Qualitative	1. In-depth interview	Cai & Li (2018); Shantha, (2019); Somarathna, (2020) Karabulut & Hatipolu (2020)
	2. Case study	Xie et al., (2019) Chien et al., (2021)
	3.content Analysis	Wang & Yang (2020)
	4.Discourse Analysis	
	5.Fuzzy set theory	
Literature review	1. Systematic Literature review	Takalo et al., (2021); Oduro et al., (2021); Khan et al., (2021) Seman et al., (2019); Li et al., (2022); Schiederig et al.,(2011)
	2. Literature review	Khanra et al.,(2021)
	3. comprehensive literature review	

Source: Developed by the researchers based on literature

3.9 Sample Size of Relevant Green Innovation Studies

As Figure 7 presents, the sample size of the majority of studies used for this review is between 200 and 300 respondents. Few studies can be seen above 500 respondents.

Figure 7: Sample Size of relevant green innovation studies

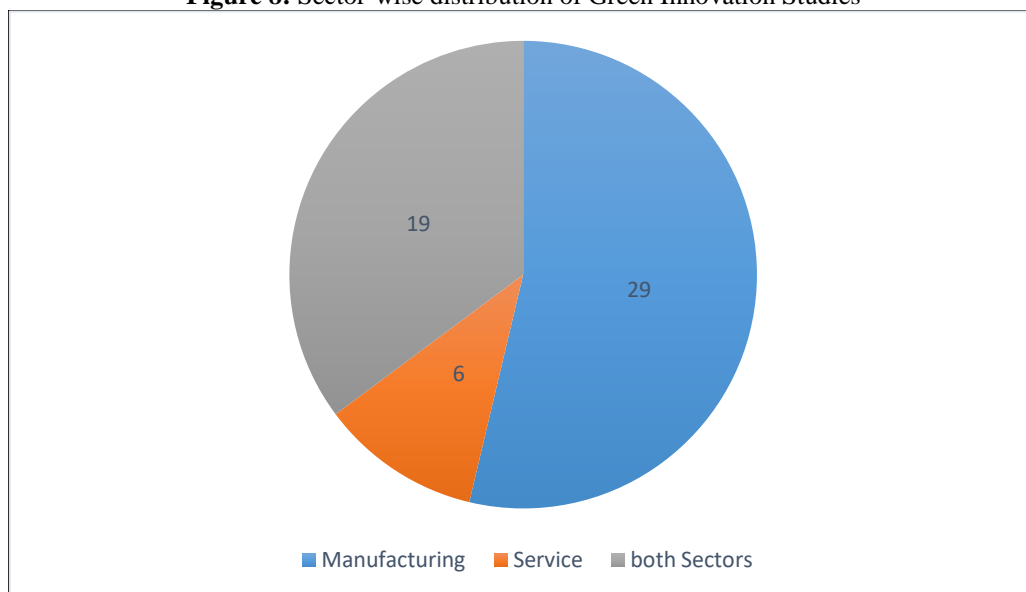


Source(s): Review Data, 2023

3.10 Different Sectors of Green Innovation Studies

According to Figure 8, most of the green innovation studies (29 studies) have been done in manufacturing firms, and only six studies have been conducted in service sector organizations. 19 studies have considered both manufacturing and service organizations. Hence, it implies that there is a lack of empirical research in the service sector in terms of green innovation studies.

Figure 8: Sector-wise distribution of Green Innovation Studies



Source(s): Review Data, 2023

IV. DISCUSSION

The focus of studies selected in this article has revolved around different aspects of GI. Therefore, the discussion in this section focuses on the theoretical underpinnings, thematic areas, geographical coverage, and different methodologies used.

It was revealed that (see Figure 4), see most used theories are the Resource-based View, Resource Dependence theory, Institutional theory, and Stakeholder theory in GI studies.

Gap 1: Theoretical Gap

A different aspect of the GI can be explored by taking into account different theoretical explanations for future studies.

When discussing the thematic area, under the theme of *benefits of GI*, discuss the firm performance and firm value (Khan et al., 2021). The extant literature on GI has broadly focused on firm performance and competitive advantage under the theme of *benefits of GI*, nonetheless, it is lacking literature on firm value. Furthermore, under the theme of *structural changes*, green management, green HRM, and gender diversity have been discussed (Khan et al., 2021). The existing literature did not pay enough attention to green management, green HRM, and gender diversity. Moreover, men and women differ in their sensitivity to nature and their care for others. In that sense, women are more sensitive to ethical issues, and environmental issues. It is needed to see whether there is any difference with gender in the GI study. 15% of the reviewed articles gave evidence regarding the study of institutional pressure on GI. According to Dimaggio & Powell (1983), the institutional theory, under uncertain situations, three different types of external pressures influence firms' decision-making. Namely, coercive, normative, and mimetic pressures (Chu et al., 2018). Coercive forces contain pressures from external actors such as governments through regulatory policies. Normative pressure includes pressure from customers through values and standards of conduct, and mimetic pressure comes from competitors and industry peers (Liu et al, 2010). More in-depth studies are needed to explore the institutional pressure on GI.

The relevant literature on GI (Khan et al., 2021), has studied five organizational capabilities; green motives, corporate environmental ethics and commitment, environmental management systems, R&D strength, and technological readiness, which is required to firm for GI practices. According to the review articles, researchers have not empirically examined factors that influence the green motives of firms. Further, the literature seems to be silent on corporate environmental ethics and commitment and fails to discover the unethical behavioral practices of firms. Not many studies have been undertaken to recognize the capabilities required for environmental management systems implementation. Moreover, the prior literature has not done research on green R&D activities and technological readiness.

Organizational learning is a critical factor in the GI process. Firms learn from different parties including their customers, suppliers, and competitors, and transmit new knowledge to the firm. The extant literature on GI did not focus enough on organizational learning especially, creative thinking and Inter-organizational learning. Under the theme of barriers to GI development, Khan et al., (2021), explained external and internal barriers. However, only 2% of review articles have discussed the barriers to developing GI and researchers have not examined external and internal barriers for GI. Then it needs to explore external and internal barriers for the GI.

Gap 2: Thematic Area Gap (Empirical Gaps)

Accordingly, the above discussion can be summarized as follows: The following areas need to be empirically examined by future researchers:

- *Benefits of GI(firm value)*
- *Structural changes (green management, green HRM, and gender diversity)*
- *Institutional pressure on GI (coercive, normative, and mimetic pressures)*
- *Organizational capabilities (green motives, corporate environmental ethics and commitment, environmental management systems, R&D strength, and technological readiness)*
- *Organizational learning (creative thinking and Inter-organizational learning)*
- *Barriers to GI development (external and internal barriers)*

Gap 3: Contextual Gap

It is evidenced (see Figure 6) that there are lack of studies about GI in the Sri Lankan context. Among the 60 studies, only one was done in Sri Lanka. Moreover, more than half of the empirical studies included in this review are from China (see Figure 5), while other developed or emerging economies have been avoided.

Hence, this contextual gap needs to be addressed in future endeavours.

Gap 4: Methodological Gap

When investigating the *data collection method*, most of the reviewed articles collected primary data from survey questionnaires, semi-structured interviews, and e-mail (see Table 3) to test the hypothesis. To minimize the method variance bias, other data collection methods can be incorporated into future research. Particularly, qualitative data

collection methods can be used in qualitative research to explore new knowledge in the field of green innovation. *The unit of analysis* of the reviewed articles is chief executive officers, top-level executives, and managers from the top and middle levels. Supervisors, junior employees, and customers have been neglected. *Sample size*: Most of the empirical studies included in this review used data from fewer than 250 respondents. Therefore, the results may not be generalizable to a wider segment of firms.

- Most data collection methods are cross-sectional in nature, and a limited number of studies utilized a longitudinal survey design. Then, it needs to use different data collection methods related to the different natures of the studies.
- As a unit of analysis, future researchers can use junior employees and customers since they are also important stakeholders in a firm. Their ideas are important to gain a competitive advantage as they are part of the process of decision-making.
- Future studies should design a sample size to adequately represent the population.
- The literature review and qualitative research method were done in a comparatively limited number of studies. Hence, future studies should conduct the literature review method to develop the existing body of knowledge. And qualitative studies to understand concepts of green innovation.
- Since there is little empirical evidence regarding service sector organization among the revealed articles, it is need to pay more attention to green innovation studies in the service sector to address this found gap.

V. FUTURE IMPLICATIONS

First, the study identifies the key studies on GI. To get a good understanding of GI. Second, four research gaps are identified in this study: a theoretical gap, a thematic area gap (an empirical gap), a contextual gap, and a methodological gap. These identified gaps may open new avenues for GI research. Particularly, the thematic partition of the selected articles tries to paint a broad picture of the different aspects of GI research. This theme-based modification of the literature can help researchers broaden their exploration of key issues in GI research. Further, this study may guide practitioners in decision-making on green practices.

Third, as a practical implication, managers need to work on developing the organizational capabilities required for GI. Further, managers need to cultivate green thinking and a green culture, and the present study provides valuable insights for managers.

VI. CONCLUSION

This study of the current literature makes a valuable contribution to the existing body of knowledge in GI. First, this study identified key studies relevant to green innovation. Then, it analyzed year-wise distribution, journal-wise distribution, country of study, Theme-based Segregation, the method used, and sample size. Mainly, four research gaps were identified: theoretical gaps, thematic area gaps (empirical gaps), contextual gaps, and methodological gaps.

Finally, this study theoretically and practically contributes to future research and provides valuable insight into managers.

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