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Green Operations Practices and Their Role in Achieving Environmental Sustainability Through Intelligent Quality Management

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Abstract: The objective of this research is to examine the influence of stakeholders' perspectives on the implementation of green innovation (GI) practises, and the subsequent impact on both environmental and organisational performance (OP). Additionally, this study seeks to explore the potential moderating role of innovation orientation in this relationship. A comprehensive examination of previous scholarly works was conducted. In order to gather data resources, the present study has considered previously published research from reputable sources. A noteworthy correlation has been identified between gastrointestinal practises and environmental and occupational health outcomes. The study revealed a statistically significant negative moderating impact. This study presents a variety of contributions and gives implications for decision-making.

Key words: environment, sustainability, green operations, green innovation.

INTRODUCTION

Business enterprises function within intricate contexts, whereby stakeholders exhibit a growing inclination towards the procurement of sustainable goods and services of superior quality. Therefore, due to intense market competition, increased stakeholder awareness, and stringent government restrictions, several companies have been compelled to prioritise environmental sustainability, operational efficiency, and sustainability issues (Karimi, E. K. 2014). Green operations practises (GOP) are defined as practises that contribute to improving the environmental performance of firms' operations. The operations function encompasses several essential activities, including production planning, product and process development, supply chain management, manufacturing, and after-sales operations (Nunes,2011). Environmental technology, also known as E-TECH, encompasses the utilisation of environmental sciences to advance technological innovations, enhance technological infrastructure, implement structural and managerial technologies, and adapt products. The primary objective of E-TECH is to ensure the sustainability, monitoring, and mitigation of environmental damage. Therefore, the current emphasis on environmental technology and creative green practises aimed at preserving the environment is of utmost importance in contemporary times.

The implementation and operation of a green environment is no longer just considered a business expenditure, but rather an incentive that fosters the creation of new market possibilities and facilitates the achievement of sustainable growth. The rationale for this phenomenon is that corporations, facing demands from diverse stakeholder entities, chose to include environmental practises, such as the integration of environmental technology, as a means to address stakeholders' concerns and provide mutual advantages for all parties involved. Hence, the integration of sustainability philosophy into corporate strategy has become imperative as environmental management has exerted influence on several aspects of a company's strategic approach (Sheikh,2014).

According to Al Sheyadi, A. (2014), the current research trend in environmental technology is characterised by its multidisciplinary nature, including several themes such as climate, environmental technology, sustainability, and manufacturing. The impetus to adopt environmentally sustainable practises has not only become an integral aspect of several companies' corporate social responsibility. An increasing number of environmental challenges are being addressed via the implementation of green initiatives in the realms of production, service, and manufacturing. Business enterprises are therefore actively pursuing more inventive approaches to foster environmentally sustainable conditions by incorporating green practises into their operational processes.

In the current period characterised by increasingly pressing environmental concerns, it is essential for organisations to use their resources effectively and foster collaborative relationships with stakeholders in order to effectively tackle these environmental issues. The capacity of organisations to effectively address environmental concerns via creative approaches may serve as a foundation for achieving a sustained competitive advantage. In order to attain sustainable competitive advantage, it is imperative for businesses to prioritise the development and utilisation of their superior resources and capabilities, as emphasised by MUTHEKE, F.(2016). This is particularly crucial as the effective incorporation of environmental technology in product ideas and processes serves as a key driver of competitive advantage. Furthermore, the presence of environmental technology as a dynamic capability provides enterprises with a distinct capacity to enhance, upgrade, or develop novel capabilities, particularly in response to alterations in their surroundings. Hence, it is essential for organisations to harness environmental technology in order to get a competitive advantage via enhanced operational efficiency.

The stakeholder theory has been used as a framework to adopt a more comprehensive viewpoint in examining the influence of various stakeholders on a corporation's environmental practises, specifically in relation to green operations. Additionally, it aims to ascertain the overall effect of these activities on the organization's performance as a whole. According to the stakeholder theory perspective, Kuo, S. Y., & Lin, P. C. (2020) advocated for companies to adopt differentiation strategies by including green practises in both their operational processes and product innovation. This phenomenon may be attributed, in part, to the influence of stakeholder demands, which often shape the formulation of effective strategies for environmental innovation. Although the significance of this phenomenon is still limited, several firms have begun to see an increasing inclination and request from customers about environmentally friendly goods, projects, or programmes. Due to the influence of stakeholders, organisations may exhibit a greater inclination to embrace environmentally conscious practises, which are crucial for attaining sustainability. This entails considering new inputs, engaging in activities that promote sustainability, and using advanced research and development methodologies. According to Rong, K. (2019), several firms saw the connection between consumers' increasing expectations for environmentally friendly

practises and the quality control movement throughout the 1980s and 1990s. These businesses expected that such demands would eventually become obligatory rather than optional.

According to Seuring, S. (2017), addressing the environmental load and concerns related to manufacturing necessitates the adoption of technology that is more ecologically conscious. Numerous researches support the proposition of embracing new environmental technology as a means to address and proactively enhance environmental performance. According to the works of Suki et al. (2023), it can be seen that, the authors emphasised the need of doing more research on the various patterns of persistence shown by creative green operations (both in terms of processes and products) and the technical innovation persistence that is crucial for the sustainable development of enterprises and industries. Therefore, it is essential for organisations to prioritise technological innovation in order to improve their sustainability performance, as suggested by Wang and Juo (2021).

The integration of environmental commitment, whether in operational practises or the use of advanced technologies, is closely associated with both the quality of products or services and the overall success of a business. Shaw, D. (2016) assert that the body of research pertaining to environmental management is vast; yet, some aspects, such as the examination of firm-specific competences that facilitate the adoption of environmental practises, remain relatively unexplored. Numerous empirical studies have individually examined various dimensions pertaining to the link between green operations, technology, and sustainability. However, to have a comprehensive understanding of this relationship, more investigation is necessary. According to the research conducted by Leung, T. K. P. (2012), there is a limited number of studies that have conducted empirical assessments on the effectiveness of environmental information technology in the field of operations management, especially in developing countries. While the majority of research on sustainability have mostly concentrated on the triple bottom line indicators of performance, it is essential to adequately address the factor of quality in sustainable performance to ensure long-term sustainable growth. In order to address this research void and enhance the current body of literature in this domain, the present study constructs a conceptual framework aimed at attaining sustainable quality performance by integrating environmental technology and green operations.

This work makes a valuable contribution to both theoretical and empirical literature, enhancing our comprehension of green operations and sustainable quality performance across several dimensions. The present study makes a valuable contribution to the understanding of green operational features that have received little attention in previous research. Specifically, it focuses on the creative inputs, outputs, activities, and resource efficiency approaches used by enterprises operating in this setting. Additionally, this study examines the degree of dedication shown by companies towards environmental technology, encompassing green technical advancements and chosen tactics, as well as the impact of these efforts on enhancing environmental operational efficiency. This research examines the relationship between green operations and sustainable quality performance across many levels. Therefore, organisations have the ability to enhance their performance by formulating operational plans that consider the effects on internal, external, and managerial quality performance. Furthermore, the inclusion of the additional quality factor aspect enhances the comprehensiveness of sustainability literature, expanding upon the conventional triple bottom line framework. The objective of this research is to provide valuable insights into the achievement of sustainability via a comprehensive examination of innovative green operations. The intended audience for these results includes policymakers and practitioners.

Literature Review

The adoption of environmentally friendly practises in manufacturing and service operations by firms has been motivated by the expectations placed upon them by different stakeholders about organisational environmental responsibility. Therefore, in order to meet the expectations of many stakeholders in the business, it is essential to implement green manufacturing and service operations, as highlighted by Wang, X. (2015), in order to ensure the provision of high-quality goods and services. Thomas, A. (2020) assert that in some industries, the adoption of environmentally aware practises and adherence to environmental standards are often recognised as key components of green operations. In addition, Ramanathan, R. (2015) posited that the concept of green operations pertains to the incorporation and synchronisation of environmental management methods into production and operational processes, with the aim of enhancing environmental performance. In their study, Naaz, S. (2021) defined the green operation as an innovative approach aimed at mitigating pollution and minimising discharge throughout the production process. This may be accomplished via several means, such as facility renovations, process upgrades, and waste treatment methods. This study argues that the concept of green operation encompasses a firm's dedication to incorporating environmentally friendly practises in its product and service operations. This includes the integration of inventive input, innovative output, innovative activities, and resource efficiency activities. In a recent investigation conducted by Hathaway, B. & Zailani, S. (2023), an examination was undertaken to assess the impacts associated with the adoption of environmentally sustainable operating practises across several operational domains. The findings of the study demonstrated a favourable influence on operational performance, namely in terms of quality, and provided empirical evidence to assist managers in their efforts to advocate for environmental practises that enhance operational performance. Similarly, Umar, M., Khan (2022) conducted a study on environmentally sustainable manufacturing, which suggested that engaging in environmentally sustainable manufacturing practises and operational activities, such as pollution prevention measures like minimising raw materials consumption, recycling solid waste, and reducing resource usage (e.g., energy and water), could potentially have a positive impact on the competitive outcomes related to the quality of products and services.

In recent times, several organisations throughout the globe have been progressively adopting the ideas of sustainability. The literature has provided several viewpoints on the definition of an organization's sustainable performance (Appolloni et al., 2022). However, the organisational performance metrics that are most often used include both financial and non-financial components. Abbas and Sağsan (2019) assert that a limited number of models in the existing literature focus only on the factors of quality when measuring organisational success. Consequently, more global organisations are gradually adopting sustainability norms. Tripathi et al. (2023) demonstrated the significance of including the sustainability criteria into performance assessment methods by developing a comprehensive framework that integrates quality and sustainability. Similarly, the works of Abbas (2020) have integrated the concept of quality as a metric for evaluating an organization's success across different operational activities. According to Yu et al. (2021), it has been observed that certain environmentally-friendly practises may have a negative impact on the overall quality of goods and services offered. Hence, a challenge arises in achieving a harmonious equilibrium between quality and environmental performance. Therefore, companies are faced with the task of identifying environmentally friendly practises in their manufacturing and service operations, including the use of novel inputs and resource efficiency strategies, in order to fulfil the expectations of stakeholders for sustainable quality. In addition, organisations are confronted with several hurdles including environmental, operational, and quality concerns. These challenges

include unethical practises aimed at reducing operating expenses, heightened customer expectations for quality and safety, and environmental obstacles arising from expanded manufacturing and service activities.

Environmental technology refers to a set of methods, procedures, or goods that are specifically designed to mitigate environmental pollution, reduce energy consumption and the utilisation of raw resources, and enhance the recyclability of materials (Haldorai et al., 2022). In corroboration with this definition, Mondejar et al. (2021) used the concepts of green product and process innovation as a means to ascertain and quantify the extent of environmental technology. Therefore, it may be inferred that companies' environmentally friendly practises can also be integrated with environmental technology. Abdou et al. (2020) assert that technology advancements have the potential to enhance operational efficiency in several industries, including manufacturing and services. According to Asiaei et al. (2022), it is necessary for enterprises to possess flexibility in order to react to environmental changes and effectively use developing green technology. This is crucial for achieving sustainable production and consumption, while also minimising environmental harm and maximising economic benefits. Furthermore, Raut et al. (2021) emphasised the need of promoting the use of environmental technology and technical equipment in the manufacturing process in order to facilitate a favourable outcome in terms of industrial green growth.

Moreover, Suki et al. (2023) have pointed out that the mere investment in environmental technology does not guarantee an enhancement of the triple bottom line. Rather, the time and manner in which expenditures are allocated towards environmental technology within internal operations and resource management are equally crucial factors to consider. These classifications, widely supported in the literature on environmental management, have significant implications for the green operations of firms. In addition, Wang and Juo (2021) asserts that there exists a favourable correlation between increased investment in pollution control technology and the inventive input of operations, specifically in terms of incorporating ecological raw materials into the operational process. In line with previous research, Malik et al. (2020) assert that enterprises that use pollution avoidance technologies, such as recycling throughout the production process and making fundamental modifications to product design and manufacture, have shown significant improvements in operational performance. In addition, Chung (2020) discovered that the integration of green innovative operations inside a company's goods and processes, along with the adoption of innovative technology, may result in the attainment of a competitive advantage by effectively allocating resources.

The optimisation of emerging green technologies is essential in order to minimise their environmental effect and maximise their economic benefits, hence promoting sustainable production and consumption practises. Ren et al., (2020) conducted an early investigation on the subject of technology transition, focusing on the potential for inducing significant shifts in technology at a broad scale. The study placed particular emphasis on the pursuit of radical changes in technology that would contribute to environmental sustainability. The concept of sustainable quality performance encompasses more than just the product and service dimensions of quality. It also encompasses other dimensions related to corporate sustainable development. Therefore, for the purposes of this study, sustainable quality performance is defined as the internal, external, and managerial aspects of quality that contribute to sustainability. In a study conducted by Ren et al. (2020), it was discovered that the implementation of internal green practises, such as the incorporation of pollution prevention in structural investments during product and process adaptation, as well as the utilisation of control technologies, can contribute to the attainment of quality management, competitive advantage, and sustainable economic efficiency.

Tang et al. (2022) highlighted the need of prioritising green technology and implementing optimised operations via the use of business process management in order to achieve sustainable quality. In light of the resource-based approach, it is important to see environmental technology as a competence possessed by organisations that enhances their internal structure and contributes to the overall improvement of sustainable quality performance. Shahzad et al. (2020) asserts that the implementation of social equality policies in the field of environmental technology has the potential to enhance performance outcomes, both inside the organisation and in relation to external stakeholders. Furthermore, the incorporation of environmental and economic dimensions in enterprises' environmental technology strategies enables the attainment of sustainability and development objectives by promoting the effective utilisation of resources in the context of green operations. Based on the aforementioned empirical evidence, it can be said that the utilisation of environmental technology, namely via structural investments, infrastructure advancements, and pollution control technologies, has the potential to enhance the correlation between green operation and sustainable quality performance.

Findings

Stakeholder View (SV)

The term "stakeholders" was first introduced by the "Stanford Research Institute" in 1963 and was originally described as "the groups whose support is essential for the continued existence of the organisation" (Mousa and Othman, 2020). The notion of stakeholder involvement in decision-making was introduced as a strategic discipline by Khan et al. (2021). This idea emphasised that stakeholders were distinct from shareholders and had a role in the decision-making process. From an academic standpoint, the concept of "stakeholder theory" presents a distinct viewpoint on organisations and provides a comprehensive depiction of a company's framework and daily operations (Appolloni et al., 2022). The stakeholder theory, which was established by Abbas and Sağsan (2019), posits that organisations are interconnected with several processes that are influenced or disrupted by their outcomes (Abbas, 2020). Furthermore, these linkages are acknowledged inside the protocols and outcomes of the organisations, as well as in the perspectives of their stakeholders.

Furthermore, it is imperative that the interests and well-being of stakeholders be not prioritised at the expense of the safety and security of others. According to Haldorai et al. (2022), the focal point of organisations lies in their decision-making processes. The stakeholder theory has gained recognition in several ecological research studies due to its effectiveness in influencing both corporate environmental awareness (Haldorai et al., 2022) and the formulation of environmental policies. Despite the varied consequences and the uncertain perspectives of stakeholders on ecological management. of a study conducted by Abdou et al. (2020), it was discovered that the decision-making process for eco-friendly strategies and policies is mostly undertaken by the board of directors of organisations. Conversely, small company entities and owners are responsible for making decisions related to green innovation, as shown by Raut et al. (2021). Furthermore, it has been observed that stakeholders in manufacturing organisations in Germany play a significant role in influencing the firms' decisions regarding ecological response strategies. These stakeholders have also been found to have a positive association with unproven green innovation. On the other hand, the relationship between eco-friendly policies and stakeholder management in Belgian organisations was not found to be flawless. According to the findings of Wang and Juo (2021), the effect of stakeholders' perspectives on GI practises is shown to be more significant.

Green Innovation (GI)

The works of GI are often categorised under two distinct kinds. The first description characterises GI as the capabilities of a company, whereas the subsequent definition delineates GI as the environmental practises of an organisation. In the realm of organisational practises, the term "Green Innovation" (GI) refers to the implementation of hardware or software innovations that are associated with environmentally friendly products or processes (Chung, 2020). It is suggested that GI encompasses both management practises and technological advancements that enhance both environmental and organisational performance (OP), thereby granting firms a competitive advantage. According to Mousa and Othman (2020), some scholars propose that green innovation (GI) encompasses distinct or modified systems, processes, products, and practises that confer environmental benefits and contribute to the long-term viability of businesses.

According to Tang et al. (2022), GI is defined as the incorporation of new or modified goods and processes, including technological, managerial, and organisational innovations, that contribute to the preservation and maintenance of the surrounding environment. Additionally, the term GI may be defined as a creative endeavour aimed at mitigating adverse environmental effects or generating environmental advantages while simultaneously creating commercial value. Green innovation (GI) may be categorised into two types: "green product innovations," which include the development of new environmentally friendly items for customers, and "green process inventions" or the use of sustainable practises in company operations (Appolloni et al., 2022). Moreover, as a result of the increasing concerns among customers regarding environmental protection, the implementation of ecological management has become a crucial aspect of strategic policies and tactical plans for many companies. Environmental regulations can potentially create a "win-win situation" by simultaneously increasing profits and reducing pollution. It is suggested that Green Innovation (GI) should be distinguished from other innovative strategies, as it not only generates positive spill over effects for exploration and expansion efforts but also yields beneficial external outcomes such as improvements in the environment. Feng et al. (2018) conducted a research on manufacturing enterprises in the Chinese sector, which revealed a substantial correlation between internal and external environmental orientation and the adoption of green innovation practises. The implementation of green infrastructure practises inside and beyond the confines of enterprises' limitations is crucial for influencing both economic and environmental performance objectives. Furthermore, a study conducted by Yu et al. (2021) revealed that the motivation to embrace green innovation (GI) practises and corporate environmental responsibility is influenced by several variables, including stakeholders' demand, organisational support, and social expectations. Furthermore, the research conducted by Raut et al. (2021) shown a significant correlation between variables such as GI, regulation, supplier intervention, and technology, and their impact on sustainable performance. This relationship is further mediated by the capacities of service innovation. The research conducted by Khan et al. (2021) provides more evidence in favour of eco-friendly practises, demonstrating that the implementation of environmental management practises yields both direct and indirect benefits for environmental performance. In their research, Chung (2020) examined the role of green product innovation as a moderator in the relationship between green process innovation and organisational performance (OP). However, the findings of the study did not provide evidence for this relationship.

Conclusion

The need to adopt environmentally sustainable practises, sometimes referred to as going green, has compelled globally active organisations to continuously enhance their green capabilities,

implement green initiatives to mitigate future environmental degradation, and enhance overall firm performance. Hence, the objective of this research is to ascertain the primary determinants influencing the adoption of green infrastructure practises and their consequent effects on organisational performance, as seen by stakeholders. Based on the findings, it can be inferred that competitive pressure has a favourable and statistically significant influence on the adoption of green innovation (GI) practises. Additionally, governmental pressure is shown to have a favourable and statistically significant effect on the adoption of GI practises. Moreover, the findings of our study indicate a good correlation between GI practises and employee behaviour. Furthermore, the findings of our study indicate that the implementation of good governance practises has a favourable and statistically significant impact on organisational performance. The results of the research indicate a good correlation between GI practises and environmental performance.

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