Green Knowledge Management and Innovation for Sustainable Development: A Comprehensive Framework

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Abstract: This paper explores the concept of Green Knowledge Management (GKM) and its relationship with sustainable development and green innovation. A comprehensive review of relevant literature was conducted to gain a better understanding of the components of GKM. Based on this review, a conceptual framework was proposed to outline the intricate interrelationships between GKM, green innovation, sustainable development, organizational green culture, consumer resistance, pro-environmental behaviour, and environmental knowledge. The proposed framework stresses the significance of managing green knowledge effectively to attain sustainable development goals through green innovation. It also highlights the importance of promoting an environmentally friendly culture within the organization to strengthen the link between green knowledge management, green innovation, and sustainable development. Furthermore, the framework acknowledges the potential resistance of consumers towards adopting green innovation products. To overcome this challenge, companies must provide adequate environmental knowledge and encourage pro-environmental behaviour among consumers. This will enable companies to manage their green knowledge effectively and promote sustainable development through green innovation. In conclusion, GKM is a crucial factor in developing green innovation and achieving sustainable development. Organizational green culture plays a significant role in strengthening the bond between GKM and sustainable development. The proposed conceptual framework provides a clear understanding of the complex relationships between green knowledge management, green culture, sustainable development, consumer resistance, pro-environmental behaviour, and environmental knowledge. It underscores the importance of managing green knowledge and fostering an environmentally friendly culture within organizations to achieve sustainable development goals through green innovation. This paper's findings have significant implications for companies that seek to promote sustainable development through green innovation. By effectively managing their green knowledge, companies can develop innovative solutions that address environmental challenges while achieving sustainable growth. Furthermore, by promoting an environmentally friendly culture, companies can ensure that their employees and customers embrace sustainability as a core value, leading to a more sustainable future for all.

Keywords: Green knowledge management, Green innovation, Sustainable development, Consumer resistance, Environmental knowledge, Conceptual framework, Organizational green culture, Pro-environmental behaviour

1. Introduction

The topic of knowledge management (KM) has been a topic of considerable discourse in both academic and business circles for many years. Organizations have come to recognize the importance of effective knowledge management in improving performance and competitiveness. However, with the growing emphasis on sustainability, there is a pressing need to integrate sustainable development principles into KM practices.

This paper reviews the literature on topics related to KM and sustainability, such as green knowledge management and the environmental, economic, and social aspects of sustainable development. It also covers green innovation and provides a framework that integrates all these concepts.

1.1 Knowledge Management

According to Qinghua Fu et al (2022), knowledge is an intangible and abstract asset that plays a crucial role in the effective functioning of companies. In today's dynamic business environment, companies that can successfully manage the knowledge inherent in their operations are believed to have a competitive advantage over others. Kumari et al (2021), and Aamir et al (2021) suggest that failure to do so can lead to failure. “Additionally, knowledge has transformed the traditional approach to the competition, especially in industrialized economies where natural resources were once considered the primary asset and have been replaced by intellectual property” (Pan et al, 2022). Chamba-Rueda et al (2021) and Abbas et al (2022) claim that this is why many researchers identify the current period as the age of knowledge management (KM). To conclude, effective knowledge management is crucial for companies to succeed in today's business environment, where intellectual property is the primary asset in industrialized economies.

1.2 Green Knowledge Management

“Green Knowledge Management (GKM) is a novel approach to knowledge management that strives to incorporate environmental concerns into all aspects of knowledge management. A company's commitment to GKM is judged on how it influences the organization's green performance and the potential benefits that GKM

practices might bring to the natural environment. In the present globalized market, environmentally conscious strategies and information extend beyond individual organizations to all stakeholders as recommended by the United Nations. However, with a lack of GKM literature, the need for green knowledge has increased tremendously in response to environmental challenges. As green knowledge is an intangible asset, its management differs from other resources. Failing to consider the technical and cultural aspects of GKM may negatively impact companies striving to adopt GKM practices" (UNDP, 2021).

"GKM is also necessary for both individual and organizational creative performance, with people's green learning orientation enhancing the ecological awareness of companies and breeding new ideas and solutions. To reap maximum benefits from GKM, it must be inculcated as a systematic process that involves all stakeholders in decision-making. Literature research suggests that GKM can be categorized into a system of five components: green knowledge acquisition, green knowledge storage, green knowledge sharing, green knowledge application, and green knowledge creation. The acquisition and organization of knowledge related to environmental protection are key components of green knowledge acquisition, enabling ecological resources and technology to be enriched to safeguard the natural environment" (Aboelmaged et al, 2019; Alexandra Zbuchea et al, 2019).

"For instance, The GKM model can be employed as a checklist to ensure that organizations' green measurement models are comprehended by managers and professionals to implement an effective GKM system. Besides, Environmental protection-oriented businesses can utilize the GKM tool to evaluate their performance and identify areas for improvement" (Siming Yu et al, 2022). In a nutshell, implementing Green Knowledge Management (GKM) practices is crucial for organizations to enhance their green performance, address environmental challenges, foster creative solutions, and improve decision-making involving all stakeholders.

2. Sustainable Development

In recent years, environmental concerns have become a hot topic, thanks in part to ecologists who have raised awareness about the depletion of natural resources and the negative impact businesses have on the environment by consuming resources at an alarming rate. Kumar et al (2022) provide evidence of this. As Abbas et al (2020) point out, stakeholders are now putting pressure on businesses to protect the environment and incorporate environmental concerns into their operations and societies. "The United Nations' Brundtland Commission report has spurred businesses to shift their focus to sustainable development" (UN, 1987), leading to new concepts and theories that incorporate knowledge about nature and society, as discussed by Song et al (2020).

Green knowledge goes beyond information about natural conditions and encompasses a wide range of sustainable environmental, social, and economic development strategies. Creating new knowledge is crucial for green growth and sustainable development. Dynamic organizations promote a knowledge-creation culture by encouraging their employees to share their knowledge, as noted by Wang et al (2019), and by providing adequate infrastructure and facilities. Additionally, these organizations offer non-financial and financial incentives to employees who actively share their knowledge or provide unique ideas or solutions, as stated by Xie et al (2019). Ultimately, the growing concern for environmental issues has prompted stakeholders and organizations to prioritize sustainable development and incorporate green knowledge into their operations, as evidenced by recent studies and reports, ultimately highlighting the importance of creating a knowledge-sharing culture within dynamic organizations.

2.1 Social

"Early research in the field of business management suggests that knowledge is the primary resource necessary for companies to compete effectively and gain unique advantages" (Nonaka et al, 1994). "In order to achieve this, companies must create and utilize dispersed knowledge to enhance competition" (Alavi et al, 2001) and "capitalize on external opportunities" (Lichtenthaler et al, 2009). "Employees within companies play a vital role in identifying external knowledge and integrating it with internal knowledge to improve products and processes" (West et al, 2014). "Therefore, it is reasonable to assume that human resource management (HRM), which encompasses all the strategic actions taken by a company's management that influence its relationship with employees, can impact the company's ability to acquire and manage knowledge effectively" (Beer et al, 1994).

According to research conducted by Armando Papa et al (2018), this study's findings support the significance of HRM practices in improving organizational innovation performance. The research analysed 129 companies

using regression analysis to examine the correlation between knowledge acquisition and innovation performance, revealing that HRM moderates this relationship. The results indicate that implementing HRM practices and retaining employees can amplify the impact of knowledge acquisition on innovation performance, leading to sustainable growth and effective corporate knowledge management. Therefore, the important role of human resource management practices in improving organizational innovation performance by enhancing knowledge acquisition, retention, and integration, ultimately leading to sustainable growth and effective corporate knowledge management is highlighted.

2.2 Environmental

“The sharing of knowledge related to environmentally-friendly practices, or "green knowledge sharing," can involve the transfer of knowledge between colleagues, competitors, suppliers, or other stakeholders with the goal of developing effective techniques and technologies to reduce the negative impact of business activities on the natural environment” (Song et al, 2020). “This practice is influenced by several factors including human factors, organizational culture, infrastructure and technology, reward, and recognition” (Alexandra Zbuchea et al, 2019). “Integrating green knowledge into decision-making, product/service design, and operations can enable companies to minimize or eliminate negative environmental effects, thus providing a competitive advantage” (Aboelmaged et al, 2019). Additionally, environmental knowledge encompasses information about product production and its environmental impact.

2.3 Economic

“To optimize a company's knowledge economy, a strategic approach to knowledge management is crucial. This requires consideration of various factors, including information technology, organizational structures, human resource practices, and culture” (Alexandra Zbuchea et al, 2019). “Effective knowledge management frameworks suggest that a successful KM structure should incorporate both enabling factors and processes, with a clear understanding of operations” (Pilar Bernal et al, 2022). “Organizations that consistently assess their use of knowledge are referred to as KM enablers and previous studies have differentiated between exploitative and exploratory KM processes” (Gonzalez et al, 2018). “Knowledge discovery typically involves research and development and knowledge creation, with R&D initiatives serving as a significant component of knowledge creation within a company” (Chamba-Rueda et al, 2021). “This may include developing new content or replacing outdated material in the organization's knowledge repository” (Khan et al, 2022). “Research has linked knowledge creation and innovation” (Goyal et al, 2020), “while knowledge exploitation encompasses techniques such as knowledge application, storage, transfer, and application” (Abubakar Mohammed Abubakar et al, 2019).

The United Nations has stressed the importance of raising awareness and knowledge about the environment in order to achieve sustainable development. In line with this, Muhammad Aamir Shafique Khan et al (2022) have emphasized the need for SMEs to address consumer resistance towards green innovation products. The study has found a connection between green innovation practices, consumer resistance, environmental knowledge, and pro-environmental behaviour. It highlights the crucial role of green innovation practices in SME success, while also underscoring the importance of businesses adapting their policies and marketing strategies to overcome customer resistance. The study's key findings suggest that effectively managing consumer resistance is advantageous for product acceptance and serves as a solid basis for policy-making and handling resistance to green innovation products among consumers. Thus, the strategic approach to knowledge management, the significance of knowledge creation and exploitation, and the role of green innovation practices in SME success emphasize the necessity for businesses to adapt their policies and marketing strategies to address consumer resistance and achieve sustainable development.

3. Green Innovation

Research by Juan Piñeiro et al (2019) highlights knowledge, entrepreneurship, and innovation as key drivers of economic growth and competitiveness. “These factors have a significant impact on the economy, environment, and society, making them crucial components of the United Nations Sustainable Development Goals” (UNDP, 2021). “The interdependent relationship between knowledge, innovation, and entrepreneurship means that knowledge plays a vital role in the innovation capabilities of individuals and organizations” (Chamba-Rueda et al, 2021). “Improved innovation quality leads to enhanced firm performance” (Chaithanapat et al, 2022). According to Nonaka et al (1991), organizations that adopt the knowledge-based view (KBV) can better acquire and utilize knowledge, which is critical for creating resources. The KBV identifies knowledge as the most valuable strategic resource that an organization can possess.

"Additionally, green innovation can help mitigate environmental risks such as carbon emissions and other climate change-induced consequences while reducing product impact" (UNDP, 2021).

Shouwen Wang et al (2022) conducted a study that delves into the correlation between green knowledge management (GKM), corporate sustainable development (CSD), and green innovation. The study also explores the moderating effects of organizational green culture (OGC). It examines the impact of four GKM practices on the green innovation capabilities and sustainability activities of organizations. According to the study's findings, aligning GKM initiatives with overall business policies can enhance environmental and business performance. Moreover, the study emphasizes the relevance of green culture in organizational activities and its impact on the relationship between GKM and green innovation. Additionally, the study reveals that firm size and industry significantly affect organizational capabilities for green innovation and minimally relate to CSD. Accordingly, it underscores the crucial role of knowledge, entrepreneurship, and innovation in driving economic growth and competitiveness, emphasizing the significance of green knowledge management and organizational green culture in enhancing environmental and business performance through green innovation.

4. Conclusion

This article delves into the relationship between green knowledge management, green innovation, and sustainable development. Through careful analysis, the article proposes a conceptual framework that illustrates how green knowledge management can positively impact sustainable development through green innovation (Figure 1). The framework emphasizes the importance of a company's green culture in strengthening these connections. It is also important to consider the potential resistance of consumers towards adopting green innovation products. This can be addressed by increasing their environmental knowledge and promoting pro-environment behaviour. Overall, the article stresses the essential role of green knowledge management in achieving sustainable development through green innovation.

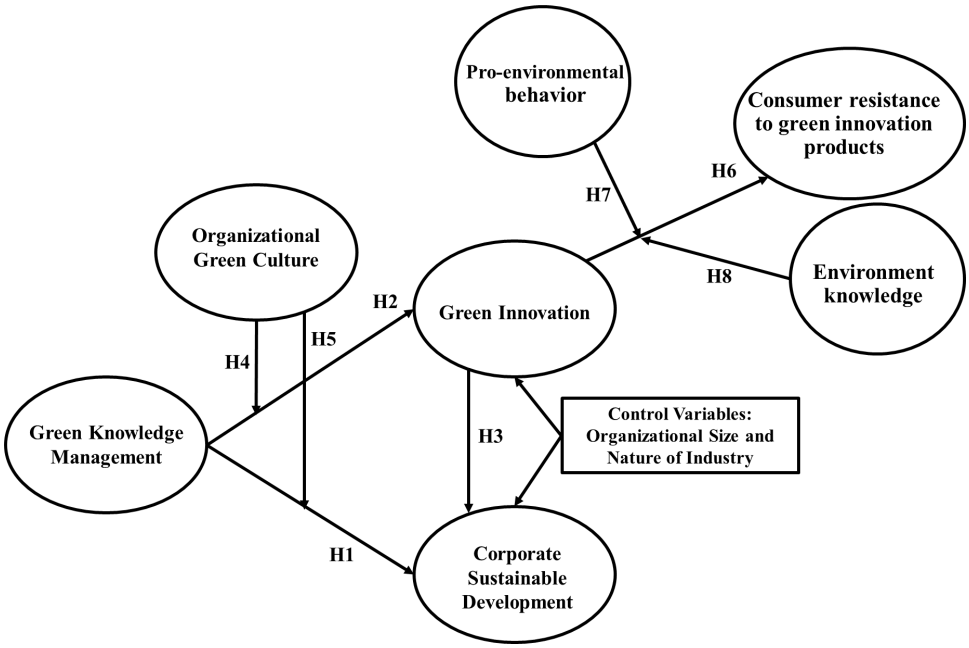

Figure 1: A Conceptual Framework

Therefore, the conclusion section proposes a conceptual framework that highlights the following relationships:

H1: Green knowledge management is a significant predictor of a company's sustainable development.

H2: Green knowledge management positively influences an organization's green innovation performance.

H3: Green innovation strengthens an organization's capabilities to achieve sustainable development goals.

H4: Organizational green culture strengthens the relationship between green knowledge management and green innovation, as well as sustainable development.

H5: Green innovation measures are negatively related to consumer resistance to green innovation products. As innovative measures increase, so does consumer resistance.

H6: Pro-environmental behaviour moderates the relationship between green innovation practices and consumer resistance.

H7: pro-environmental behaviour moderates the relationship between green innovation practices and consumer resistance. If environmental knowledge is high, the negative relationship is weak.

H8: Environmental knowledge moderates the relationship between green innovation practices and consumer resistance. If environmental knowledge is high, the negative relationship is weak.

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