

**THE EFFECT OF GREEN SUPPLY CHAIN MANAGEMENT AND
COMPETITIVE ADVANTAGES ON SUSTAINABLE
PERFORMANCE OF INDONESIAN SMEs**

THESIS

In Partial fulfillment of the Requirement for Master's Degree of Management



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2024

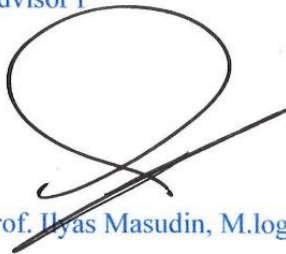
**THE EFFECT OF GREEN SUPPLY CHAIN MANAGEMENT AND
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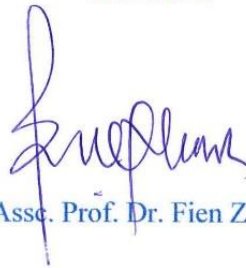
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Master Degree of Management
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Hereby, declare that:

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The Writer,



ABDUL QADIR HAKIMI

FOREWORD

I begin this work by expressing my deepest gratitude to the Almighty for granting me the strength, perseverance, and guidance throughout the journey of completing this thesis. Without His divine assistance, none of this would have been possible. I would also like to extend my heartfelt gratitude to the Prophet Muhammad (peace be upon him), whose teachings and example have been a source of inspiration and guidance in both my personal and academic life. And special thanks to my family who have been my pillar of strength and my constant source of motivation you always sacrifice yourselves and believing in my potentials. This work is as much yours as it is mine.

The author realizes that in working on this thesis” The effect of green supply chain management and competitive advantage on sustainable performance of Indonesian’s SMEs ” as one of the requirements for obtaining a Masters in Management degree at the University of Muhammadiyah Malang.” we need inner intention, patience, thoroughness, and sacrifice of time and thought. In working on a thesis, of course, there is a lot of support and motivation from both internal and external factors. The author has received guidance and direction so that this thesis runs smoothly and can be carried out well. Therefore, the researcher would like to express his deepest gratitude to:”

1. Prof. Dr. Nazaruddin Malik, SE., M.Sc. as Chancellor of the University of Muhammadiyah Malang.
2. Prof. Akhsanul In'am, Ph.D., as Director of the Directorate of Postgraduate Programs, University of Muhammadiyah Malang.
3. Assc. Prof. Dr. Aniek Rumijati, MM as Head of the Master of Management Study Program, University of Muhammadiyah Malang.
4. Prof. Ilyas Masudin, M. Log, SCM, Ph.D. is the main supervisor who has provided direction rection and guidance in writing this thesis.
5. Assc. Prof. Dr. Fien Zulfikarijah is the second supervisor and accompanying lecturer who has taken the time to provide suggestions, instructions, and correct the preparation of this thesis.
7. To Nana Tsiqatun my best classmate who helped me a lot to do this thesis. I appreciate her.

Malang, June ,19 ,2024

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ABSTRACT

This research was carried out in Malang, Indonesia, focusing on Small and Medium-sized Enterprises (SMEs) and involving a sample of 100 participants. It explores the complex relationships between competitive advantage, green innovation, knowledge management, green supply chain management, and sustainable performance. The direct impact of competitive advantage and knowledge management on sustainable performance is revealed. Nonetheless, it seems that green supply chain management has little impact as a link between green innovation and sustainable performance, suggesting that environmentally friendly practices may not be widely or efficiently implemented in the supply chain management of small and medium-sized enterprises in Malang. The study points out that green innovation may not have a direct impact on sustainable performance, possibly because of difficulties in implementing innovative environmentally friendly solutions throughout the entire supply chain. Tailored strategies are crucial for overcoming barriers to the adoption of sustainable supply chain practices in Malang, in order to strengthen the long-term sustainability of small and medium-sized enterprises. This involves enhancing the spread and integration of knowledge related to sustainability and stressing the significance of incorporating sustainability goals alongside considerations of competitive advantage.

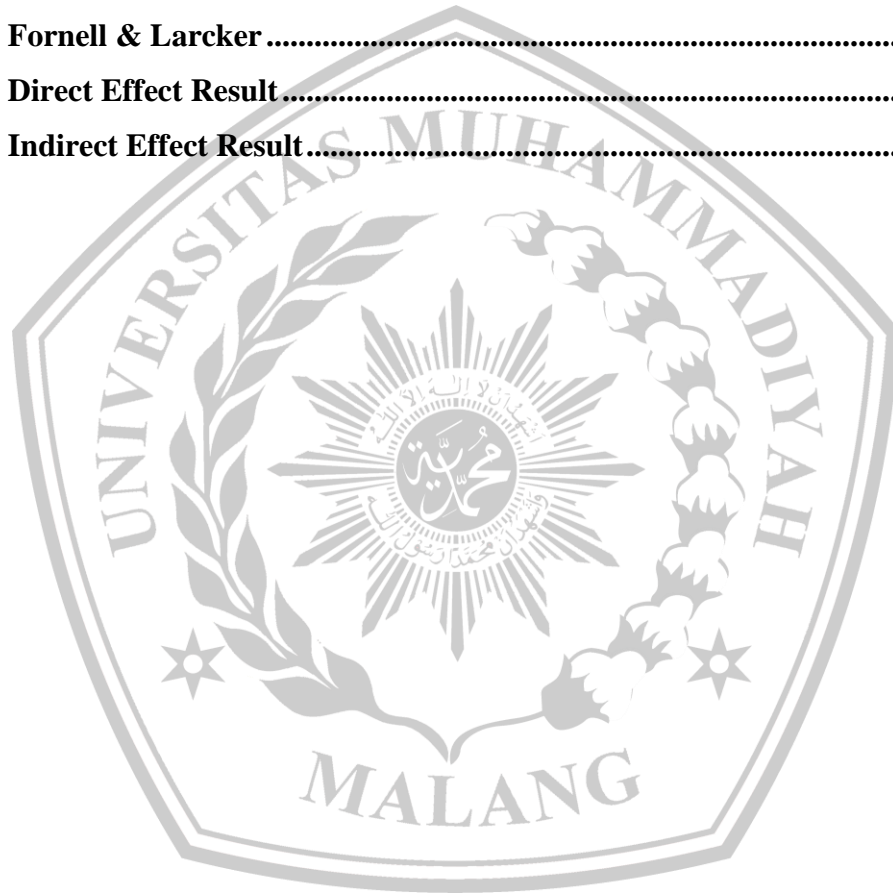
Keywords: green innovation, knowledge management, green supply chain management, competitive advantages, sustainable performance

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A. Introduction

Small and medium-sized enterprises (SMEs) make up a significant portion of the economy, according to Statista, there were an estimated 332.99 million SMEs worldwide in 2021, and they play a crucial role in employment creation, economic growth, innovation, and competition in markets (Wang and Wang 2020). Recognized globally as crucial contributors to socioeconomic development, SMEs have become integral components of growth and development policies, as outlined by (Karadag 2015). According to world bank, formal SMEs contribute up to 40% of national income (GDP) in emerging economies. To underscore the significance of SMEs, it is crucial to recognize that investigating the sustainability performance of these enterprises constitutes a vital and meaningful area of study (Malesios et al. 2021). The sustainable performance of small and medium enterprises (SMEs) in Indonesia is a topic of interest in the academic and research community. Shaping the sustainability of both production and consumption, making them crucial for the future of sustainability (Salvador et al. 2023a). Incorporating green principles into supply chain practices is crucial for small and medium enterprises (SMEs) to align their processes with environmental responsibility, as it can lead to improved environmental performance and overall firm performance (Mishra, Choudhury, and Rao 2019).

Green Supply Chain Management (GSCM) serves as a crucial strategy, providing SMEs with a framework to align their supply chain processes with environmental responsibility. Scholars, including Zhu, Sarkis, and Lai (2012), highlight that incorporating green principles into supply chain practices allows SMEs to optimize operations, from raw material sourcing to product distribution, minimizing environmental impacts a symbiotic link between Green Supply Chain Management (GSCM) and enhanced organizational performance. Their findings establish a positive correlation between the adoption of green supply chain practices and improved efficiency. GSCM not only aligns SMEs with societal expectations for eco-friendly operations but also yields cost savings through resource efficiency, bolstering corporate reputation—a crucial element in consumer-driven markets (Sarkis, Zhu, and Lai 2011). GSCM has been recognized as a key relational capability that

facilitates the strategic formulation and implementation of GSCM practices, ultimately contributing to sustainability performance (Chin, Tat, and Sulaiman 2015).

Green innovation and green supply chain management (GSCM) are integral components in enhancing sustainable performance within organizations. Green innovation involves the development and application of eco-friendly products, processes, and technologies to reduce environmental impact (Sarkis et al. 2011). Furthermore, Green innovation also refers to the development and implementation of new products, processes, and services that have a positive impact on the environment (Wang and Ozturk 2023). Research has shown that green innovation positively influences environmental sustainability, and it is a critical factor in the adoption of GSCM practices (Suleman et al. 2023). By integrating green innovation and knowledge management into their operations, SMEs can enhance their competitive advantages and improve their sustainable performance by adopting GSCM practices (Silva, Gomes, and Sarkis 2019).

Knowledge management has been discovered to hold a noteworthy connection with the long-term success of an organization. Effectively handling and sharing knowledge among relevant parties can be a valuable factor in attaining sustainable performance for businesses (Weina and Yanling 2022). Knowledge management in SMEs enhances economic sustainability, cash flow, innovation, and human capital, while also optimizing natural resource use and creating community value, making it a key driver for green innovation in corporate sustainability (Cardoni et al. 2020).

Furthermore, Competitive advantage refers to a strategy that creates product or service value from rivals with an added advantage if it is valuable, imitable, and non-substitutable (Barney 1991). Competitive advantage is conceptualized as the acquisition of a strategy that creates specific and unique resources, resources that can create sustainable competitive advantage, such as entrepreneurial competencies particularly in identifying opportunities, building partnerships, and managing the business well refer to higher levels of commitment, conceptuality, and effective strategies (Aidara et al. 2021).

Despite this, a notable research gap exists concerning the roles of "Green Innovation" and "Knowledge Management" as potential antecedents to Green Supply Chain Management (GSCM) and their collective impact on sustainable performance (Permatasari

and Gunawan 2023). While recognizing the positive impact of green innovation (Rustiarini, Bhegawati, and Mendra 2022). further exploration is needed to comprehensively understand how SMEs in Indonesia can strategically integrate these elements. This study aims to fill this gap by investigating the intricate relationships among GSCM, Green Innovation, and Knowledge Management and their specific contributions to the sustainable performance of Indonesian SMEs.

B. Problem Formulation

The study reported in this research addressed eight research problem questions as follows:

1. Does Competitive advantages (CA) have influence to the sustainable performance?
2. Does green supply chain management (GSCM) have effect to sustainable performance?
3. Does green innovation (GI) have effect to GSCM?
4. Does knowledge management (KM) have effect to GSCM?
5. Does green innovation (GI) have effect to sustainable performance?
6. Does knowledge management (KM) have effect to sustainable performance?
7. Does green innovation (GI) have effect on sustainable performance through (GSCM)?
8. Does Knowledge management (KM) have effect on sustainable performance through (GSCM)?

C. Research Focus

The key focus of this study is to determine the following:

1. To determine the effect of CA to be measured in sustainable performance.
2. To determine the effect of GSCM to be measured in sustainable performance.
3. To determine the effect of GI on GSCM.
4. To determine the effect of KM on SCM.
5. To determine the effect of GI on sustainable performance.
6. To determine the effect of KM on sustainable performance.
7. To determine the effect of (GI) on sustainable performance through (GSCM).

8. To determine the effect of (KM) on sustainable performance through (GSCM).

D. Significance of the study

1. The finding of this study can be productive for all the SMEs sized business of Indonesia and their supply chain system.
2. It can also add to existing studies on green supply chain management and competitive advantages and can be a possible guide for future researches.

E. Literature review

1. Sustainable performance

There is no clear and agreed definition of sustainability performance as very often only environmental impacts are considered rather than including social performance too (Zimek and Baumgartner 2017). While Sustainability performance refers to a company's performance related to economic, environmental and social aspects. These aspects are assessed and monitored concerning their impacts through different methods. Much of the corporate sustainability performance literature has focused on relationships, e.g. between environmental, social and economic performance (Artiach et al. 2010). Sustainable performance refers to the long-term ability of an organization to achieve a balance between economic, environmental, and social outcomes. It involves the interaction between the performance of organizations in their business and their environmental, economic, and social performance (Al-Abbadi and Abu Rumman 2023). This concept encompasses financial strength, minimizing or eliminating negative environmental impacts, and the renewal of human, job, and social resources through work processes (Bouloiz 2020).

Sustainability performance refers to the comprehensive and interconnected effects of a company's environmental and social actions on its overall performance. This can be observed through three dimensions: economic sustainability, environmental sustainability, and social sustainability (Kleindorfer, Singhal, and Wassenhove 2005). According to Scagnelli, Corazza, and Cisi (2013) industry-related environmental concerns,

including those related to SMEs. Business sustainability encompasses economic, environmental, and social aspects, yet SMEs often prioritize economic aspects due to intense competition and limited support from both government and consumers. Unfortunately, this approach can negatively impact the sustainability of the business ecosystem and the local community.

In the context of global economic integration, small and medium enterprises (SMEs) are acknowledged as pivotal drivers of sustainable economic progress, regardless of whether a country is developed or developing (Prasanna et al. 2019). Furthermore, Sustainable performance is evaluated based on various factors such as entrepreneurship, innovation, green human resource management, quality management systems, and resilience engineering (Stanciu, Constandache, and Condrea 2014). A sustainable organization must be financially stable, ensuring that it can continue to operate and grow while providing economic benefits to its stakeholders and for the point of environmental impact Sustainable performance involves the organization's environmental impacts, such as carbon footprint, reduction, social impact matrices, financial stability and customer perception index (Bouloiz 2020; Giama and Papadopoulos 2018).

a. Carbon Footprint Reduction

Energy conservation can significantly reduce operating and production costs for companies, making them hence more competitive, apart from obviously reducing also their environmental impact. Understanding energy use and defining the energy-intensive processes contribute to more energy efficient and sustainable business. Saving energy leads to the reduction of carbon emissions, reduces costs and enhances companies' image. Energy efficiency and conservation should be a part of companies' planning. There are many low-cost steps that SMEs can take to start saving energy, as well as more detailed actions with low-costs investment that can be implemented over time within an energy plan (Giama and Papadopoulos 2018). Furthermore SMEs, pivotal to the economy, resist adopting energy-efficient technologies due to inherent characteristics and aversion to change. global efforts for carbon footprint mitigation, citing factors like energy efficiency, implementation costs, technical input strategy, business value, owner's attitude, stakeholder demands, and government solutions (Dayaratne and Gunawardana 2015).

b. Social Impact Metrics

Corporate social responsibility practices create a substantial influence on firms' performance. In a Results of the structural model of H1 indicated in a research shows that CSR practices reveal a significant positive influence on the sustainable performance of business firms and SMEs and also there is a significant positive relationship between CSR practices and firms' sustainable performance (Mahmood, Ali, and Raza 2019). The strategic approach of corporate social responsibility (CSR) can be associated with sustainable practices, being considered as a source of value creation that generates competitive advantage and superior performance for companies. This perspective notes that the use of economic, social, and environmental resources and capacities can individually contribute to improving business performance (BP). In research shows that the strategic influence of the economic, social, and environmental dimensions of CSR on the performance of small and medium-sized enterprises (SMEs) SMEs can strategically use their resources and related capacities mainly for social and environmental issues, followed by the economic dimension of CSR, as an opportunity to create value and generate advantage competitive with rivals. Additionally, these three dimensions of CSR, with emphasis on the social aspect, can also provide better levels of BP in SMEs compared to competitors (Bacinello, Tontini, and Alberton 2021).

c. Financial Stability

The financial stability of small and medium-sized enterprises (SMEs) has a significant impact on their sustainable performance. Research has shown that access to finance and financial literacy play a crucial role in enhancing the sustainability and performance of SMEs (Parmitasari and Rusnawati 2023). Financial parameters, such as profitability, return on investment, net profit margin, and return on equity, have been found to influence the sustainable business performance of SMEs (Tang 2022). Additionally, it has been suggested that in the short run, financial resources can increase a firm's environmental performance, highlighting the link between financial stability and environmental sustainability (Bartolacci, Caputo, and Soverchia 2020). Furthermore, the relationship between social, environmental, and operational practices and performance

with financial performance has been assessed, indicating the interconnectedness of sustainability practices and financial performance in SMEs (Malesios et al. 2018).

d. Customer Perception Index

The Customer Perception Index (CPI) has a significant impact on the sustainable performance of small and medium-sized enterprises (SMEs). A study published in Sustainability found that the "Customer Experience" dimension is associated with external activities and is linked to the measure "customization." This suggests that customer perception, particularly in the context of sustainability, plays a crucial role in shaping SMEs' performance (Costa Melo et al. 2023). Another study (Bartolacci et al. 2020) investigated the relationship between strategic small and medium skills (SM skills) and perceived reputation, revealing that these factors have a positive direct impact on performance. Although the study does not specifically focus on CPI, it highlights the importance of customer perception in driving SMEs' performance. Another Research examined the relationship between financial literacy, the sustainability of SMEs, and the performance of SMEs. The results indicated that financial literacy contributes to the sustainability and performance of SMEs. While this study does not directly address CPI, it suggests that financial literacy, which can be influenced by customer perception, plays a significant role in SMEs' sustainable performance (Bartolacci et al. 2020).

2. Small and medium enterprise (SMEs)

It has been determined that the primary engines of rapid economic expansion are small and medium-sized businesses (SMEs) operating in both the manufacturing and service sectors. Nevertheless, small and medium-sized enterprises (SMEs) struggle with an inherent problem: a lack of resources and capabilities, which limits their capacity to improve their performance. As a result of this, it is absolutely necessary for small and medium-sized businesses (SMEs) to comprehend and cultivate an important capability that assists them in coping with a dynamic and competitive business environment. Determine whether the SME is capable of providing a solution to such problems. The US Census from 1993 found that 98.7% of all manufacturers were considered to be small or medium-sized businesses (Sutanto 2021).

Small and medium-sized enterprises are more sensitive to the costs of holding specific assets and to the costs of contracts. Small and medium-sized businesses are typically in a worse position to bargain. Small and medium-sized businesses have a poorer reputation and engender less trust. There is likely to be a cultural divide between large enterprises (LEs) and small and medium-sized enterprises (SMEs), due to the fact that SMEs' advantages are more likely to be knowledge- and product-based. This is not necessarily a negative thing, but when the smaller company has not negotiated the purchase before the purchase, the larger company is likely to have an advantage in better evaluating the target after SCM. This makes the target less desirable as operations become intertwined, so it is important for the smaller company to negotiate the purchase before the purchase. Other buyers; as a result, the prices paid by SMEs are reduced (Monczka et al. 2020).

3. Green supply chain management

Green Supply Chain Management (GSCM) is a major factor in handling current environmental problems, and is a multidisciplinary concept that has emerged through the development of environmentally friendly managerial practices, especially related to supply chain management. Choi and Hwang (2015) argued that GSCM includes various stages, such as the production process, material acquisition, product design, product distribution, and product end-of-life management. GSCM is a concept or method that in practice is described as an environmentally friendly initiative starting from design, procurement, manufacturing, delivery, to product recovery whose essence is to reduce, reuse, recycle resources (e.g. energy) to reduce environmental impacts (Tippayawong et al. 2016). In a dynamic business environment, GSCM is considered an intangible strategic capability that enables business practitioners to gain or obtain a competitive advantage for their companies by improving performance (Koberg and Longoni 2019).

GSCM is defined as a dynamic capability consisting of strategic orientations, practices, and policies that include managing internal and external environmental impacts of supply chain operations towards superior corporate performance and gaining strategic advantage (Habib et al. 2021). According to Khaksar et al. (2016) GSCM is a company strategy for long-term environmental development to face market competition, which aims

to increase profits and reduce environmental impacts. Companies that adopt GSCM can reduce pollution and environmental problems in the supply chain from upstream to downstream of the company. In adopting GSCM, companies can not only achieve competitive advantage, but also open new market opportunities and lobby the government to provide legal protection (Novitasari, Alshebami, and Sudrajat 2021).

Yildiz Çankaya and Sezen (2019) stated, GSCM refers to the distribution of goods and services from suppliers and producers to end users while taking into account monetary, information and material flows in the environment. GSCM integrates an environmental viewpoint with SCM, which includes material sourcing and selection, product design, manufacturing processes, distribution of finished goods to clients, and product disposal after expiration. This is due to consumer demands and legal requirements, environmental management monitoring and assessment is the initial stage of GSCM, culminating in the implementation of proactive measures and involving several reverse activities such as repair, recycling, rework, reuse and remanufacturing (Ali and Haseeb 2019).

Green supply chain management (GSCM) is an important aspect of sustainable business practices. Studies have shown that GSCM practices positively influence supply chain performance and environmental performance in Indonesian SMEs (Dzikriansyah et al. 2023a; Ofori Antwi, Agyapong, and Owusu 2022). Adopting GSCM practices positively impacts SMEs' firm and environmental performance. GSCM is positively related to financial profit and environmental performance, and it improves the green reputation of the organization (Shan and Wang 2018) (Islam et al. 2017). The role of GSCM in improving environmental performance has been examined in various studies. The findings revealed that GSCM practices can reduce waste disposal and improve environmental performance (Rupa and Saif 2022). Furthermore, the study found that GSCM practices can lead to the long-term development of businesses and it can improve environmental certification, waste reduction measures, renewable energy Usage and supplier collaboration (Johnstone 2022; Shan and Wang 2018).

a. Environmental Certification

Embracing sustainable practices can lead to cost savings on energy, transportation, and recycling, while also attracting environmentally conscious customers, thereby increasing loyalty and sales (Aiyub et al. 2009). Environmental certification can have a significant impact on the sustainable performance of small and medium-sized enterprises (SMEs) (Johnstone 2022). These certifications not only improve a business's reputation and elevate its brand but also drive more sustainable practices, which can save money, increase customers, and provide a competitive edge (Johnstone 2022). Moreover, the process of obtaining and maintaining a sustainability certification can drive employee engagement and help create a corporate culture that cares about the planet, the local community, and society (Aiyub et al. 2009).

By obtaining a sustainability certification, SMEs can demonstrate their commitment to environmental responsibility, improve their brand reputation, and gain a competitive advantage in the market (Johnstone 2021). Overall, environmental certifications play a vital role in not only enhancing the sustainable performance of SMEs but also in contributing to a more environmentally friendly and socially responsible business landscape (Johnstone 2022). Based on ISO certification of SMEs resources to the previously mentioned benefits, environmental certifications can also provide SMEs with access to a wider range of resources, tools, and support networks. These resources can help businesses implement sustainable practices, share best practices, and learn from others' experiences. By obtaining a sustainability certification, SMEs can become eligible for various incentives, grants, and awards, which can further boost their sustainable performance and help them navigate the competitive market.

b. Waste Reduction Measures

Waste reduction measures can significantly impact the sustainable performance of small and medium-sized enterprises (SMEs) (Ilomäki and Melanen 2001). SMEs play a crucial role in enhancing the "reduce-reuse-recycle" business model and have knowledge about green practices that are significant in reducing waste and enhancing recycling. However, SMEs face more significant obstacles and challenges related to sustainability issues than large enterprises (Malesios et al. 2021). Therefore, it is essential to provide

insightful implications and recommendations on how SMEs could properly manage waste as a critical part of sustainability issues. Waste minimization practices positively influence the operational performance of SMEs, leading to cost savings and financial performance improvement (Derhab and Elkhwesky 2023). Moreover, SMEs can achieve efficiency in production through lean and green manufacturing practices, which can improve their overall performance (Malesios et al. 2021).

SMEs can implement green practices such as responsible segregation and disposal of waste, which can lead to cost savings and environmental benefits (Bloom and Reenen 2013). Waste management and recycling in SMEs are crucial for enhancing environmental sustainability, reducing pollution, protecting the environment, and improving overall performance (Derhab and Elkhwesky 2023). However, the reduction of waste in SMEs is driven more by the costs of raw materials than by waste costs (Ilomäki and Melanen 2001). Therefore, it is essential to develop a framework that considers the criteria and methods for analyzing the sustainability performance of SMEs, which can help SMEs attain sustainability and develop circular cities (Bloom and Reenen 2013).

c. Renewable Energy Usage

The use of renewable energy in small and medium-sized enterprises (SMEs) can significantly impact their sustainable performance (Asante et al. 2021). By adopting renewable energy sources, SMEs can reduce their carbon footprint, decrease energy costs, and contribute to a more sustainable future. Moreover, the use of renewable energy in SMEs can lead to increased energy efficiency, with a potential reduction in energy demand by 30%. This can result in improved operational performance and reduced environmental impact (Aiyub et al. 2009). SMEs can enhance efficiency and sustainability by implementing key strategies, including energy audits, adopting energy-efficient measures, and investing in renewable technologies like solar panels. Governments and organizations offer incentives to encourage these initiatives, supporting SMEs in improving energy efficiency and embracing renewable sources (Asante et al. 2021).

d. Supplier Collaboration

Supplier collaboration can have a significant impact on the sustainable performance of small and medium-sized enterprises. (SMEs) (Ukko et al. 2022).

Collaborating with suppliers can help SMEs enhance their green supply chain management practices, which can lead to improved sustainable performance (Ali, Bentley, and Cao 2017). For instance, supplier collaboration can help SMEs achieve competitiveness, maximize their profit, and help their community without damaging the environment. Moreover, supplier collaboration can positively influence market performance via e-business sustainability, which can lead to high market performance (Ukko et al. 2022).

Several studies have highlighted the importance of supplier collaboration in enhancing the sustainable performance of SMEs. For example, Ali et al. (2017) found that supplier collaboration has a positive effect on firm performance in terms of innovative capability and financial results. Similarly, a study by Leu et al. (2021) revealed that supplier collaboration can lead to improved sustainable operations. Moreover, another study found that firms that interact and share information with suppliers and customers foster a sense of joint networking and collaboration, which can lead to a positive impact on firms' performance (Ukko et al. 2022)

4. Competitive advantages

Competitive Advantage (CA) is the heart of a company's performance to face competition, and the company can create a good defensive position against its competitors. According to Ukab (2021), competitive advantage is a company's ability to gain market dominance over its competitors, where CA offers above average efficiency in the long term. Laari, Töyli, and Ojala (2018) define CA as a company's ability to survive in the face of competition by offering lower value, but providing more profits. Another definition of CA was presented by Innotata, Oktamianti, and Joung (2022); Jamaludin (2021) states that CA is based on special competencies, namely company-specific strengths that can enable the company to make its products different from the products offered by competitors and have lower prices than competitors. CA as a way of meeting customer needs with differences in the most important attributes of the product produced compared to its competitors, where consistency of differences will be obtained as a direct impact of the gap between the producer and its competitors (Mukhsin and Suryanto 2017). CA is obtained if the company has the ability to better present each of its business operational processes in producing high quality goods and services at competitive prices, so that the products

produced are able to compete in terms of quality, price, product delivery and flexibility compared to its competitors in the market. moreover there are some factors that can be the indicators of competitive advantage such as product differentiation, market share growth and customer loyalty(Al-Hawary, Ibraheem, and Hadad 2016; Galli-Debicella 2021).

a. Product Differentiation

Product differentiation can have a significant impact on the sustainable performance of small and medium-sized enterprises (SMEs). The literature has extensively discussed how SMEs can demand a price premium in a consumer segment based on focus differentiation (Galli-Debicella 2021). The strategy of product differentiation affects operational performance, and SMEs that are successful with niche strategies develop a competitive advantage that is sustainable (Yunus Amar 2015). Moreover, product differentiation can lead to the creation of non-scalable core competencies, which can help SMEs develop a competitive advantage that is difficult to replicate by other firms (Galli-Debicella 2021). Another study explores factors influencing SME performance, emphasizing entrepreneurship, low-cost, and differentiation strategies. Intangible assets like character-oriented entrepreneurship and innovative ideas are crucial for gaining a competitive edge. Findings highlight the positive impact of low-cost and differentiation strategies on sustainable innovation. While entrepreneurial orientation doesn't directly affect innovation, a positive correlation suggests a stronger entrepreneurial attitude leads to higher innovation levels (Murni 2017).

b. Market Share Growth

Increasing market share appears to positively influence the sustainable performance of small and medium-sized enterprises (SMEs), even though the direct link is not explicitly discussed in available research. Variability in sustainability performance among SMEs emphasizes the need to assess different aspects of their operations for a comprehensive understanding of sustainable growth (Murni 2017). Additionally, the adoption of sustainable practices, such as lean and green manufacturing, can be associated with the pursuit of sustainability by SMEs (Malesios et al. 2021).

c. Customer Loyalty

Customer loyalty can have a positive effect on the sustainable performance of SMEs. Sustainable businesses that address their customers' concerns and take appropriate measures to implement sustainable practices can build customer loyalty. Achieving consumer loyalty is a prime objective of every business, and customers want to see how businesses take responsibility for sustainability (Ahmad et al. 2021). According to reliable foodservice industry report, gaining customer loyalty is the main success factor for a business to sustain over time (Ong, Salleh, and Yusoff 2015). Lastly, a study shows that the positive relationships between intentions and reliability component of trust are supported, which they reported both intentions and reliability exert positive influence on customer loyalty. Reliability in the foodservice industry is highly related to fulfilling the promise made via promotions advertised. A good example here is when customer received their meal in the same portion as shown in the menu or advertisement (Kantsperger and Kunz 2010).

5. Green innovation

Innovation theory suggests that sustainable innovation practices can contribute to superior sustainable performance in companies (Kneipp et al. 2019). Green innovation comprises all type of innovations that contribute to the creation of key products, services, or processes to reduce the harm, impact, and deterioration of the environment at the same time that optimizes the use of natural resources. Such type of innovation develops a critical role these days because it channels an appropriate use of the natural resources to improve the human well-being. Moreover, the creation and incorporation of changes in products and production processes could contribute to sustainable development (Leal-millán and Antonio 2020). Green innovation also involves the development and application of eco-friendly products, processes, and technologies to reduce environmental impact (Sarkis et al. 2011). When coupled with GSCM, these innovations can drive remarkable sustainability gains. Firstly, green innovation contributes to sustainability performance by fostering resource efficiency. Firms that invest in sustainable technologies and practices often realize reduced energy consumption, minimized waste generation, and decreased emissions, thereby lowering operational costs and environmental footprint (Lozano 2015).

By green innovations, we understand technologies that may enable countries to advance in the direction of more sustainable societies. To define the notion ‘green innovation Mevik and Wehrens (2007), apply “a rather pragmatic definition” stating that it “does not have to be developed with the goal of reducing the environmental burden. It does however, yield significant environmental benefits”. It was not until the study by(Leal-millán and Antonio 2020), when an exhaustive definition of green innovation is provided – “Green innovation is defined as hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management. Chen, Lai, and Wen (2006), define green innovation “as hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in number of green patents, green finance and employee involvement in innovation(Zhang, Rong, and Ji 2019).

a. Number of Green Patents

Number of green patents on the sustainable performance of SMEs is a topic of research interest. Green patents, which provide environmental benefits, are used to measure a firm's green entrepreneurial activity. Research suggests that green innovation, as measured by green patents, can positively influence firm performance for SMEs, with different types of green patents (e.g., utility-model innovation, invention innovation) having varying effects. For example, one study found that green utility-model innovation positively influences firm performance for SMEs, while green invention innovation does not show a significant effect on firm performance (Yin et al. 2022). Additionally, a study on listed manufacturing firms in China found that green patenting influences a firm's subsequent performance(Zhang et al. 2019). However, it is important to note that the specific number of green patents and their timing in relation to financial benefits for SMEs may vary based on firm size and other factors (Semenova, Semenov, and Storchevoy 2023). A study by Semenova et al. (2023)found that medium-sized firms enjoy improved financial performance in the first two years after the implementation of one or two green patents, but the third green patent does not show significant improvements. manufacturing

firms in China for the 2000–2010 period found that green patenting influences a firm's subsequent performance (Zhang et al. 2019).

b. Green finance

Several studies have addressed the effect of green finance on the sustainable performance of SMEs. A study found that green finance has a positive and significant effect on sustainable performance in Chinese SMEs (Wang et al. 2023). Another study on "Technological Innovation, Sustainable Green Practices and SMEs Sustainable Performance in Times of Crisis (COVID-19 pandemic)" revealed that SMEs should adopt sustainable green practices, including green finance, to enhance their sustainability performance (Alraja et al. 2022). In a paper discussed the importance of SMEs in achieving sustainability goals and the need to take into account the characteristics and advantages of bank-financed SMEs in sustainable finance frameworks (Greitens 2023). "The Role of Green Creativity, Business Independence and Green IT Empowerment" found that green finance, along with green creativity and business independence, can enhance SMEs' sustainable performance and green competitive advantage (Setyaningrum, Kholid, and Susilo 2023).

c. Employee Involvement in Innovation

Research suggests that employee involvement in innovation can positively impact the sustainable performance of SMEs. For example, a study found that employee creativity plays a mediating role in the relationship between human resources and sustainable product innovation performance (Muñoz-Pascual, Galende, and Curado 2021). Another study revealed that various factors, including competent human capital, can enhance manufacturing SMEs' sustainability performance (Dwikat, Arshad, and Mohd Shariff 2023). Additionally, a study on "Explaining sustainability performance and maturity in SMEs" found that devoting time and resources to engage with customers in product and process development can lead to increased sustainability performance (Salvador et al. 2023b). These studies provide insights into the positive influence of employee involvement in innovation on the sustainable performance of SMEs, emphasizing the importance of human capital and creativity in enhancing sustainability and competitive advantage.

6. Knowledge management

A shift in focus has led organizations to re-evaluate their business management approach, moving away from tangible assets towards valuing people's skills and experience. Adapting to this change involves a mindset shift, as previous management practices did not emphasize sharing knowledge among employees. Effective knowledge management within organizations has become increasingly vital, given that many organizational and societal activities today rely on knowledge. This practice is now known as Knowledge Management (KM) (Samir 2020). Companies now bear responsibility for the broader impact of their operations on the environment and society, beyond just generating economic value from resources. This has led to a triple-bottom-line approach to evaluating organizational performance, integrating measures of environmental, social, and economic performance (Kafetzopoulos, Psomas, and Kafetzopoulos 2013) (Schaltegger and Burritt 2014).

Knowledge management has been discovered to hold a noteworthy connection with the long-term success of an organization. Effectively handling and sharing knowledge among relevant parties can be a valuable factor in attaining sustainable performance for businesses. The practice of knowledge management has been identified as a contributor to fostering a sustainable environment. This is due to the significance of environmental consciousness and the utilization of eco-friendly technologies as integral aspects of sustainable performance, with knowledge management serving as a mediator in this correlation (Weina and Yanling 2022). Knowledge management seeks to achieve not a static management of information or existing knowledge, but a dynamic management of the process of creating knowledge (Whelton, Ballard, and Tommelein 2002). Furthermore there are some other indicators that affect on the knowledge management such as training hours on sustainability, employee awareness survey, employee satisfaction with knowledge management (Sult, Wobst, and Lueg 2023).

a. Training Hours on Sustainability

Training hours on sustainability in SMEs has been a subject of research. Studies have shown that well-designed training can lead to better environmental, social, and economic performance (Sult et al. 2023). Investing in sustainable training and sustainable

rewards has a correlation with employees' sustainable performance, indicating that enterprises should attach great importance to sustainable education and training (Kang, Hsiao, and Ni 2022).

The negative tendency towards investment in training was identified by Kotey and Folker (2007) who highlighted that despite the fact that SME's owner/managers tend to acknowledge the importance of training and development in improving a company's performance, SMEs are generally reluctant to provide formal employee training. The training of employees in SMEs is an unplanned activity and usually achieved through on the job training and there is usually little or no provision for employee development that involves releasing the employee from the job for short periods of time (Hill and Stewart 2000). Owners–managers of SMEs have the responsibility for a systematic approach to training based on needs assessment of the employees (Burlea and Remmé 2017, (Macmahon and Murphy 1999).

b. Employee Awareness Surveys

Employee Awareness Surveys play a crucial role in assessing and enhancing the sustainable performance of Small and Medium-sized Enterprises (SMEs). The effect of this on sustainable performance of SMEs can be inferred from some studies. In a study found that eco-transformational leadership, eco-training, and employee eco-behavior positively influence sustainable corporate performance in SMEs (Novita et al. 2022). According to ESG For SMEs to reduce their environmental impact, enhance their brand reputation, and gain access to new markets and opportunities, employee engagement in sustainability has become increasingly vital. Not only do sustainable practices contribute to a healthier environment, but they also demonstrate a company's commitment to social responsibility, which can attract customers who value ethical and sustainable business practices.

c. Employee Satisfaction with Knowledge Management

According to the knowledge-based view Robert M. Grant (1996) the knowledge located in various places within the firms, such as employees, organizational culture, routines, policies, systems, and documents is the main asset used to reach and sustain competitive advantages, since it is unique and hard to replicate and replace. Companies are

facing a knowledge economy (Beijerse 2000). where everything rapidly changes, demanding a capacity to continuously readapt themselves to confront the new challenges. In the specific context of SMEs, knowledge and knowledge management (KM) have become a primary source to support firms' innovation and sustain economic survival (Idowu 2013). The question of knowledge is particularly relevant for SMEs, since they have to often rely on employees' knowledge and skill in order to build their competitive advantages instead of relying on physical and financial assets, as compared to larger firms (Cardoni et al. 2019).

F. Conceptual framework

This research analyses the influence of green innovation and knowledge management on sustainability performance mediated by green supply chain management. Green innovation and knowledge management are exogenous variables, green supply chain management is a mediating variable, while sustainable performance is an endogenous variable and competitive advantages also exogenous variable which effect on sustainable performance. The research framework can be seen in the following picture.

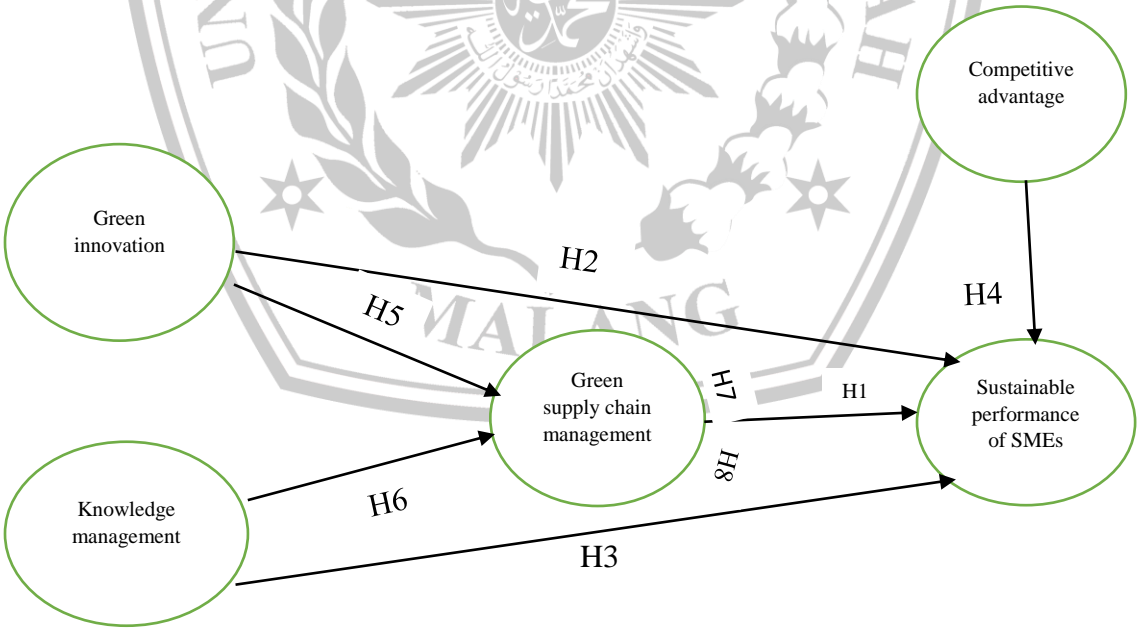


Figure 1. Conceptual framework

G. Hypothesis

1. Effect of GSCM on Sustainable performance of SMEs

Sustainable performance of small and medium-sized enterprises (SMEs) has been a topic of increasing interest in the past five years. Research has shown that SMEs differ significantly in their sustainability performance and maturity, and that they play an important role in the economy by contributing to GDP and employment (Salvador et al. 2023c). A study has highlighted the importance of technological innovation and sustainable green practices in enhancing the sustainable performance of SMEs, especially in times of crisis such as the COVID-19 pandemic. The study emphasized the need for strong leadership, organizational practices, and the correct technological support and aligned processes for SMEs to achieve their performance goals and maintain a competitive advantage (Alraja et al. 2022). Furthermore, in another research explained the sustainability performance of the companies in our specific sample, with different sub-aspects contributing specifically to each sustainability dimension. Based on our analysis, identifying what sub aspects contribute to explaining the sustainability performance of an SME, a few recommendations can be made to SMEs in order to improve their sustainability performance (Salvador et al. 2023).

Ability of the enterprise to function in a coordinated and systemic manner, without losing capacity of performance in indefinite future, shall be connected with sustainable development, which incorporates all three dimensions: social, economic and ecologic. The basis for implementing sustainability is formed by the enterprise management systems, which provide functional efficiency and effectiveness of sub-systems, taking into consideration principles of sustainable performance (Ciemleja and Lace 2011). SMEs business sustainability is one of the major concerns of any industry. Sustainability constitutes of economic, environmental and social aspects of business. Due to intense competition and lack of support from regulatory authorities and customers often SMEs prioritize economic aspects providing less emphasis on environmental and social initiatives. This may cause serious negative impact on the overall sustainability performance of the specific industrial supply chain and in turn entire region (Malesios et al. 2021).

The impact of GSCM practices on environmental performance has been examined in the context of Indonesian SMEs. The study found that implementing GSCM practices can improve the environmental performance of Indonesian SMEs (Dzikriansyah et al. 2023a). The role of GSCM practices on environmental performance in the mining industry has also been examined. The study found that GSCM practices have a positive impact on sustainable performance in the mining industry (Ofori Antwi et al. 2022). Furthermore, the impact of GSCM practices on business performance has been examined. The study found that GSCM practices have a positive impact on environmental and operational performance, which in turn positively impacts business performance (Abdallah and Al-Ghwayeen 2020).

Green supply chain management (GSCM) practices have a positive impact on sustainable performance. Studies have shown that GSCM practices can reduce waste disposal and improve environmental performance. Furthermore, GSCM practices can lead to the long-term development of businesses. The influence of GSCM practices on corporate sustainability performance has been examined in various studies. The findings revealed that GSCM practices positively influence corporate sustainability performance by controlling energy usage and exhaustible resources (Yildiz Çankaya and Sezen 2019). The relationships between different dimensions of GSCM and the three sustainability performance factors (economic, environmental, and social) have been explored in a study. The study found that all GSCM dimensions, except for green purchasing, are related to at least one of the performance dimensions (Yildiz Çankaya and Sezen 2019).

The role of GSCM practices on environmental performance in the mining industry has also been examined. The study found that GSCM practices have a positive impact on sustainable performance in the mining industry (Ofori Antwi et al. 2022). Furthermore, the impact of GSCM practices on business performance has been examined. The study found that GSCM practices have a positive impact on environmental and operational performance, which in turn positively impacts business performance (Abdallah and Al-Ghwayeen 2020). GSCM also positively impacts sustainability performance by minimizing environmental risks and enhancing resilience. Through supplier collaboration and transparency, GSCM reduces the exposure to potential disruptions and supply chain

bottlenecks. In a study by Pagell and Shevchenko (2014), it was found that companies with strong GSCM practices were better equipped to adapt to changing environmental conditions, ensuring a more stable and sustainable supply chain performance.

H1: green supply chain management effects on sustainable performance

2. Effect of competitive advantages on sustainable performance

Competitive advantages can have a significant impact on sustainable performance. Sustainable competitive advantages are a set of assets, characteristics, or capabilities that allow an organization to meet its customer needs better than its competition can. These advantages are difficult to duplicate or replicate, and they answer the question, “What are we best at in our market?” Sustainable competitive advantages are advantages that are not easily copied and, thus, can be maintained over a long period of time (Hermundsdottir and Aspelund 2021). Sustainability strategies can create competitive advantages by improving efficiencies, reducing costs, and improving access to capital (Gupta and Benson 2011; Yu 2022).

SMEs that are successful with niche strategies develop a competitive advantage that is sustainable when it cannot be copied by large firms. For a sustainable competitive advantage to exist, the differentiation valued by the focused consumer segment cannot be easily replicated by other firms, let alone by large firms who possess more resources than the SMEs. In order for competitive advantages to be successful, sustainability is necessary, and non-scalable core competencies are the key to sustainability for an SME niche strategy (Galli-Debicella 2021). Therefore, SMEs need to identify their sustainable competitive advantages and develop strategies to maintain them in order to achieve sustainable performance and remain competitive in the market (Kraja and Osmani 2013).

H2: Competitive advantages effects on sustainable performance

3. Effect of Green innovation on sustainable performance

Green innovation has a positive impact on sustainable performance. Studies have shown that green innovation has a positive relationship with environmental and financial performance (Purwanto et al. 2022). Furthermore, the study found that green innovation can motivate and enhance green innovation (Li et al. 2023). The correlation

between external environmental factors and green product innovation, as well as the impact of green product innovation on the environmental and financial performance of manufacturing SMEs, has also been examined. The study found that customer pressure, government pressure, government support, and market changes all had a beneficial effect on green product innovation. Furthermore, this study found a strong positive relationship between green product innovation and environmental and financial performance (Ha et al. 2023).

Sustainable innovation practices adopted by firms signify a positive influence on organizational fulfillment as it creates a green organizational identity (Ahmed et al. 2023). The role of green innovation in the effect of corporate social responsibility on firm performance has also been examined. The study found that green innovation positively influences sustainability and financial performance (Ahmed et al. 2023; Rustiarini et al. 2022). Green innovation may help businesses balance their environmental expenses by increasing resource productivity, which has a positive financial and economic development (Ha et al. 2023).

H3: Green innovation effects on sustainable performance

4. Effect of green innovation on green supply chain management

Green innovation plays a pivotal role in shaping the landscape of sustainable business practices, particularly within the realm of green supply chain management (GSCM). The integration of environmentally friendly technologies and processes not only enhances operational efficiency but also significantly reduces the ecological footprint of supply chain activities. Research by Sarkis and Zhu (2018) underscores the positive impact of green innovation on GSCM, emphasizing its ability to foster environmental responsibility and resilience. Another study claimed that green innovation plays a significant role in green supply chain management. Green supply chain management (GSCM) practices can lead to green innovation, which can help businesses perform better by reducing air energy use, material use, and hazardous material use. GSCM can provide competitiveness while boosting a company's environmental sustainability if implemented effectively. Green innovation mediates the effect of GSCM on firm performance. The

relationship between GSCM and green innovation needs to be explored further by including the whole GSCM practices (Wang and Ozturk 2023).

H4: green innovation effect on green supply chain management

5. Effect of knowledge management on green supply chain management

According to the search results, knowledge management has a positive effect on green supply chain management (GSCM). Firms with better knowledge management capabilities are more likely to adopt GSCM practices, which can lead to improved economic and environmental performance (Bao 2019). Knowledge management can also mediate the effect of GSCM on firm performance by improving production technology, supply chain integration, and green supply chain adoption (Hartono, Siagian, and Tarigan 2023). Furthermore, knowledge management practices can help reduce knowledge gaps in the management of purchases and supplies, which is essential for sustainable supply chain management (Kassaneh, Bolisani, and Cegarra-Navarro 2021). Another study shows knowledge that is created and transferred can help the supply chain members to create a product or service, to improve the operational efficiencies, and to create or improve processes. Therefore, we contend that learning is a pre-requisite to effective application of knowledge (Sambasivan, Loke, and Abidin-Mohamed 2009).

H5: knowledge management effects on green supply chain management

6. Effect of Knowledge management on sustainable performance

Knowledge management has demonstrated a favorable influence on sustainable performance, indicating its potential contribution to fostering a sustainable environment (Martínez-Falcó et al. n.d.; Weina and Yanling 2022). This is because environmental consciousness and the adoption of eco-friendly technologies constitute critical elements of sustainable performance, with knowledge management serving as a mediator in this connection (Martínez-Falcó et al. n.d.). Knowledge management has the capacity to drive corporate sustainability through the augmentation of green innovation. The various phases of the knowledge management process, including acquisition, dissemination, and application, have the potential to stimulate green innovation, subsequently impacting corporate sustainable performance (Shahzad et al. 2020).

H6: knowledge management effects on sustainable performance

7. Effect of green innovation and green supply chain management on sustainable performance

Green innovation and green supply chain management (GSCM) are integral components in enhancing sustainable performance within organizations. Green innovation involves the development and application of eco-friendly products, processes, and technologies to reduce environmental impact (Sarkis et al. 2011). When coupled with GSCM, these innovations can drive remarkable sustainability gains. Firstly, green innovation contributes to sustainability performance by fostering resource efficiency. Firms that invest in sustainable technologies and practices often realize reduced energy consumption, minimized waste generation, and decreased emissions, thereby lowering operational costs and environmental footprint (Lozano 2015). For instance, the adoption of cleaner production techniques and renewable energy sources in manufacturing processes not only aligns with sustainable goals but also improves resource utilization efficiency (Ahmadov and Helo 2018). By integrating green innovation into GSCM, companies can achieve significant cost savings while promoting environmental responsibility.

Green innovation combined with Green Supply Chain Management (GSCM) can bolster sustainability performance by enhancing product and process differentiation. The research shows that GSCM and green innovation can improve the sustainable performance of enterprise (Li and Yan 2021). Green innovation combined with Green Supply Chain Management (GSCM) not only aligns with consumer preferences but also strengthens market competitiveness. GSCM can provide competitiveness while boosting a company's environmental sustainability if implemented effectively (Nureen et al. 2023). Green innovation focuses on cost-cutting and product differentiation (Novitasari and Agustia 2022). For an organization to become more sustainable, they need to tap and excel in green innovation, followed by green intellectual capital and green SCM (Sembiring, Junika, and Azmi 2023). By revealing the sustainable social and economic environment, green innovation and GSCM can strengthen market competitiveness (Nureen et al. 2023).

H7: Green innovation effects on sustainable performance through green supply chain management

8. Effect of knowledge management and green supply chain management on sustainable performance

Knowledge management and green supply chain management (GSCM) are two important factors that can contribute to sustainable performance in organizations. Knowledge management capability (KMC) can help organizations to adopt GSCM practices, which can lead to improved environmental sustainability and overall performance (Habib and Bao 2019). By combining KMC and GSCM practices, organizations can develop new products and processes that are both environmentally friendly and cost-effective, improving their competitiveness in the market (Assumpção et al. 2022). The adoption of GSCM practices can help organizations to reduce their environmental impact by optimizing their supply chain processes, reducing waste, and improving energy efficiency (Nureen et al. 2023). GSCM practices can also help organizations to prepare for the challenges of climate change and other environmental threats by reducing environmental risks and improving resilience (Assumpção et al. 2022). By adopting GSCM practices, organizations can meet the demands of environmentally conscious consumers and comply with sustainability standards and regulations. KMC can help organizations to identify and adopt GSCM practices that are most effective for their specific needs and goals (Habib and Bao 2019).

H8: Knowledge management effects on sustainable performance through green supply chain management

H. Research Methodology

1. Research design

Research design is the framework of research methods and techniques chosen by a researcher. The research design let researchers to focus on research methods that are suitable for the subject. The purpose of this study is to analyze the effect of green supply chain management and antecedents of green supply chain management on SMEs performance. Therefor confirmatory research design is being used in this research. And based on focus of this study a quantitative technique is adopting as a research design.

2. Research Location

The research location is the location where all research activities will take place.

This study was carried out in one of Indonesia's biggest cities, Malang.

3. Population and Sample

a. Population

According to data from the Central Statistics Agency of East Java in 2019, the total of UMKMs in Malang City is 13,111 businesses/companies (Maulana and Ibrahim 2022). The Malang City Government's alignment with local MSMEs is very real and continues to be strengthened, including by issuing Malang Mayor Circular Letter Number 5 of 2021 concerning Priority for the Use of Micro, Small and Medium Enterprise Products and Creative Economy Actors in the Procurement of Goods and Services for the Malang City Government through the East Java Application Bejo and Bela Procurement. The Malang City Government has also allocated 46 percent of the procurement of goods and services intended for small businesses and/or cooperatives in the 2022 fiscal year there are several leading MSME industrial centers in Malang, Indonesia. These include the rattan industry, furniture industry, Tempe chips industry, ceramic industry, and sanitation facilities industry (Prakasa 2019). However, there is no specific information on the number of leading MSME industries in Malang. Some studies have been conducted on MSMEs in Indonesia, including Malang, and their competitive advantages, challenges, and sustainable performance. These studies have focused on various aspects of MSMEs, such as digital transformation, strategic alliances, and organizational performance (Kurniawati et al. 2021).

b. Sample

For sampling technique we used a simplified formula to calculate sample size named (Madow 1968).

$$n = \frac{N}{1 + N(e)^2}$$

N = population (13111)

n = sample size

e = precision (10%)

$$n = \frac{13111}{1 + 13111 (0.1)^2} = 99.2448$$

Based on the calculation, the sample used in this study was 99 respondents.

4. Concept definition of Variables and Indicators Table

Table 1. Concept Definition of Variables and Indicators variables

Variable Definitions	Indicators	Reference
Competitive advantage is a company's ability to outperform rivals by creating greater customer value and effectively exploiting market opportunities.	a. Product differentiation b. Market share growth c. Customer loyalty	(Galli-Debicella 2021) (Murni 2017) (Ahmad et al. 2021)
Green Supply Chain Management (GSCM) is a method of managing the flow of goods, services, and information to reduce the environmental impact and promote sustainability.	a. Environmental certification b. waste reduction measures c. renewable energy usage d. supplier collaboration	(Aiyub et al. 2009) (Ilomäki and Melanen 2001) (Asante et al. 2021) (Ukko et al. 2022)
Green innovation is the development of new or improved products, processes, and services that reduce environmental impact and promote sustainability.	a. number of green patents b. green finance c. employee involvement in innovation	(Semenova et al. 2023) (Wang et al. 2023) (Muñoz-Pascual et al. 2021)
Knowledge management (KM) is the process of gathering, organizing, and distributing information within an organization to improve its performance and decision-making capabilities	a. Training hours on sustainability b. employee awareness surveys c. employee satisfaction with knowledge management	(Sult et al. 2023) (Novita et al. 2022) (Idowu 2013)
Sustainable performance is the ability of a system, organization, or process to maintain a consistent level of quality, efficiency, and effectiveness over a long period without	a. carbon footprint reduction b. social impact matrices c. financial stability d. customer perception index	(Giama and Papadopoulos 2018) (Mahmood et al. 2019) (Parmitasari and Rusnawati 2023) (Costa Melo et al. 2023)

Variable Definitions	Indicators	Reference
compromising its resources or capabilities		

5. Data analysis

Partial Least Squares It uses a method called structural equation modeling (PLS-SEM), which combines causal and predictive components. While estimating models, which are designed to also give causal justifications, it prioritizes prediction skills. PLS-SEM is useful for validating measurement models as well. The first step entails running a measurement model test to evaluate the reliability and validity of the construct used to create each indication. This ensures the measurement model's correctness.

a. Outer model

The outer model critically evaluates the effectiveness of chosen measurement tools in our research framework. It examines the connections between observed variables and the hidden constructs we aim to measure, focusing on the accuracy of indicators in representing latent constructs. This step assesses both reliability and validity, ensuring the robustness of our measurement model.

Convergent Validity: Outer Loading > 0.6 & AVE ≥ 0.5 (Item Valid)

b. Inner model

Beyond assessing measurement precision, the inner model in our research framework explores relationships between reliable and valid measurements. Similar to connecting the dots, it investigates how different dimensions, once measured, interrelate. For example, in measuring intelligence, it explores connections between problem-solving ability and math skills, revealing insights into complex relationships within our research scope.

1. Discriminant Validity: Fornell larger every item > 0.7 (item valid)

2. Composite Reality: Cronbach Alpha > 0.7

The structural model assessment is the following phase, which is done using the t-test developed from PLS (Partial Least Squares) to see if there is an impact of the variable or a connection between concepts. The t-test within the partial least square's framework corresponds to the goal of the structural model assessment, which is to analyze the relationship between the evaluated ideas. Analysis of the R-Square model, which shows

the degree of interdependence between model variables, can be used to assess structural or internal models.

R-Square: Strong = 0.75, Moderate = 0.50, Weak = 0.25

a. GOF: Q-Square > 0 Model has a predictive relevance value

Calculating the route coefficient estimate is the next step. This estimated value was obtained via bootstrapping and relates to the path link within the structural model. For each unique path association, it is considered significant when the statistical 1.65 (at a 10% significance level).

I. Results And Discussion

a. Demographic Information of Respondents

According to the information we gathered from the survey of this below is a table showing the gender, age, education and the number of employee distribution of the respondents in the research overview.

Table 2. Respondents Characteristic

Gender	Male	67
	Female	33
	Total	100
Age	21-29	46
	30-39	36
	40-49	14
	>49	4
	Total	100
Education	Diploma	39
	Bachelor	36
	Postgraduate	25
	Total	100
Number of Employee	<5 People	49
	6-25 People	51
	Total	100

In this survey conducted in Malang, Indonesia, respondents were categorized based on several demographic and professional factors, including gender, age, education level, and the size of the companies they work for. The majority of respondents identified as male, comprising 67% of the total, while females made up the remaining 33%. In terms of age distribution, the largest group fell within the 21-29 age range, representing 46% of

respondents, followed by those aged 30-39 (36%), 40-49 (14%), and those over 49 years old (4%). Education-wise, respondents were fairly evenly distributed across different levels, with 39% holding a diploma, 36% a bachelor's degree, and 25% a postgraduate qualification. Lastly, regarding the size of the companies where respondents were employed, a nearly equal split was observed, with 49% working in establishments with under 5 employees, and the remaining 51% in companies with 6-25 employees. This diverse respondent profile provides valuable insights into the perspectives and characteristics of individuals within the SME (Small and Medium-sized Enterprises) sector in Malang, which can inform decision-making processes and resource allocation strategies tailored to the needs of this specific demographic.

b. Partial Least Square (PLS) Partial

Partial least squares model analysis involves the analysis of the outer model.

Analysis of internal models and testing of hypotheses.

Table 3. Validity Result

Variable	Indicator	Running 1	Running 2
Green innovation	GP	0.888	0.889
	EI	0.912	0.912
	GF	0.928	0.927
competitive advantage	MG	0.901	0.901
	CL	0.917	0.917
	DP	0.920	0.920
green supply chain management	REU	0.557	-
	EC	0.826	0.843
	WRM	0.870	0.890
	SC	0.880	0.879
knowledge management	TH	0.921	0.921
	EAS	0.929	0.929
	ES	0.933	0.933
sustainable performance	FS	0.649	0.648
	CPI	0.714	0.715
	RCF	0.862	0.862
	SIM	0.862	0.862

The statistical measure of outer loading, also referred to as indicator reliability or factor loading, is utilized in structural equation modeling to evaluate the connection between observed variables (indicators) and underlying constructs (factors). The table shows the outer loadings for different indicators in two consecutive iterations. A loading of 0.6 or above usually indicates a robust relationship between the indicator and the underlying construct. For example, in the situation of Green Innovation, in both iterations, all measures - GP (0.888/0.889), EI (0.912/0.912), and GF (0.928/0.927) - show strong outer loadings, suggesting a strong connection with the concept of green innovation. In the same way, indicators related to Competitive Advantage like MG (0.901/0.901), CL (0.917/0.917), and DP (0.920/0.920) also show strong outer loadings, indicating their trustworthiness in assessing the competitive advantage concept. On the other hand, in the context of Green Supply Chain Management, the REU indicator shows a lower external load of 0.557 in the initial iteration, suggesting a potential weaker connection to the construct. On the other hand, EC, WRM, and SC demonstrate strong outer loadings, indicating their trustworthiness in evaluating the green supply chain management concept. In general, these external loading values offer understanding about the dependability and accuracy of the indicators in representing their corresponding concepts in both phases.

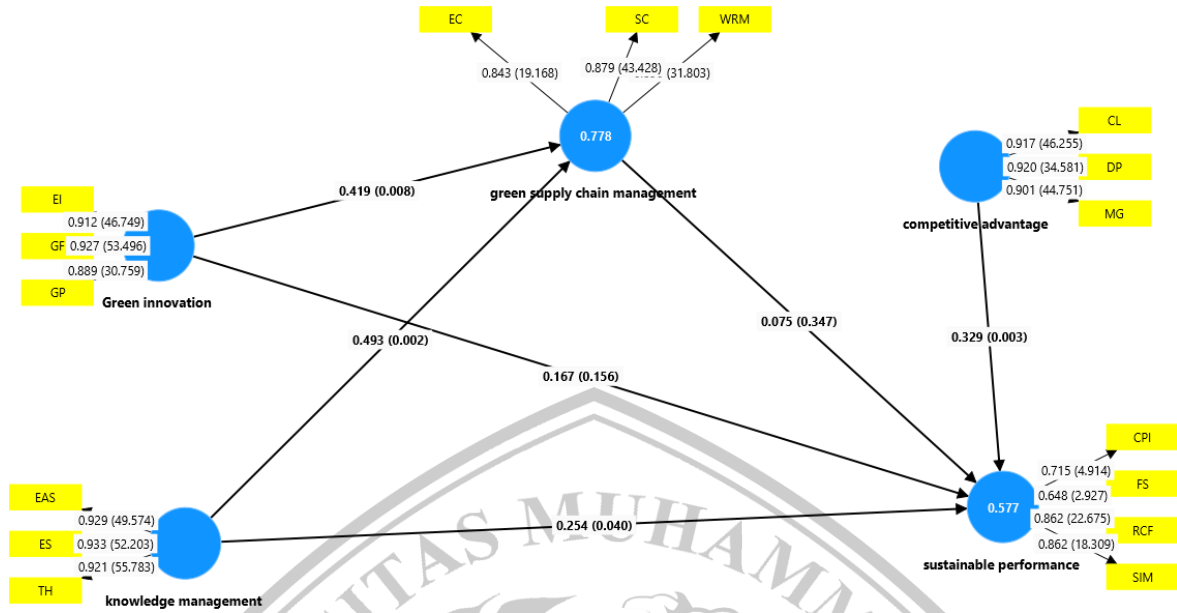


Figure 2. Result of SmartPLS

Discriminant Validity The results of the AVE value in this study can be seen in Table Reliability and AVE

Table 4. Reliability and AVE Result

Variable	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Green innovation	0.896	0.900	0.827
competitive advantage	0.900	0.911	0.833
green supply chain management	0.841	0.847	0.758
knowledge management	0.919	0.919	0.860
sustainable performance	0.791	0.843	0.604

The table presented provides various reliability measures for distinct latent constructs within a structural equation model. Cronbach's alpha, composite reliability, and average variance extracted (AVE) are frequently utilized metrics for evaluating the internal

consistency, reliability, and convergent validity of constructs within academic research. Cronbach's alpha serves as a tool to assess the internal consistency reliability of a given set of items, thus providing insight into the extent to which these items are closely associated when considered collectively. Elevated values indicate a stronger degree of internal consistency. As an illustration, Knowledge Management displays a substantial Cronbach's alpha value of 0.919, denoting robust internal coherence among its component elements.

Composite reliability is an alternative method for measuring the internal consistency reliability of a construct, taking into account the standardized loadings of items on the construct. This is an indication of the degree to which all elements consistently evaluate the same underlying concept. Constructions that demonstrate composite reliability values exceeding 0.7 are typically deemed satisfactory. In this instance, the Competitive Advantage displays a robust composite reliability of 0.911, signifying the strong trustworthiness of its measurement.

AVE is a measure that evaluates the proportion of variance explained by a construct in comparison to the variance attributable to measurement error. A higher AVE value, usually exceeding 0.5, indicates a more robust convergent validity, thus implying that the construct effectively encompasses the variability present in its indicators. As an example, the construct Green Innovation demonstrates an AVE of 0.827, suggesting that a significant portion of the variation in its indicators is attributed to the construct rather than to measurement error.

Table 5. R Square Result

Variable	R-square	R-square adjusted
green supply chain management	0.778	0.773
sustainable performance	0.577	0.560

The R-squared value or coefficient of determination quantifies the percentage of variability in the dependent variable that is accounted for by the independent variables in a regression model. In this particular situation, the R-square values of 0.778 for Green

Supply Chain Management and 0.577 for Sustainable Performance demonstrate the degree to which these variables are accounted for by their predictors or determinants. The R-square value of 0.778 for Green Supply Chain Management indicates that the independent variables in the regression model account for approximately 77.8% of the variance in this variable. This suggests that the predictors have a high level of explanatory power in accounting for differences in green supply chain management practices. Likewise, in the case of Sustainable Performance, the R-square value of 0.577 indicates that approximately 57.7% of the variance in sustainable performance can be accounted for by the explanatory variables in the model. Although the proportion is slightly lower than that of the R-square for green supply chain management, it still suggests a noteworthy level of predictive capability of the factors in impacting sustainable performance outcomes.

Table 6. Fornell & Larcker

Variable	Green innovation	competitive advantage	green supply chain management	knowledge management	sustainable performance
Green innovation	0.910				
competitive advantage	0.703	0.913			
green supply chain management	0.847	0.801	0.871		
knowledge management	0.868	0.761	0.857	0.928	
sustainable performance	0.682	0.700	0.697	0.713	0.777

The Fornell & Larcker criterion is a method used to assess the discriminant validity of constructs in a structural equation model by comparing the square root of the average variance extracted (AVE) of each construct with the correlations between constructs. In the provided table, the diagonal elements represent the square root of the AVE for each construct, while the off-diagonal elements represent the correlations between constructs.

Looking at the table, the diagonal elements, which represent the square root of the AVE, are all higher than the correlations between each construct and all other constructs, indicating good discriminant validity. This means that each construct shares more variance

with its own measures than with measures of other constructs, supporting the idea that the constructs are distinct and measure different underlying concepts.

The square root of the AVE for green innovation is 0.910, indicating that 91% of the variance in the green innovation construct is explained by its own measures. Similarly, for competitive advantage, green supply chain management, knowledge management, and sustainable performance, the values are 0.913, 0.871, 0.928, and 0.777 respectively, all above the correlations with other constructs.

Table 7. Direct Effect Result

Hypothesis	Relationship	Original sample	T statistics	P values	Result
H1	competitive advantage -> sustainable performance	0.329	2,742	0.003	Accepted
H2	green supply chain management -> sustainable performance	0.075	0.392	0.347	Not accepted
H3	Green innovation -> green supply chain management	0.419	2,418	0.008	Accepted
H4	knowledge management -> green supply chain management	0.493	2,830	0.002	Accepted
H5	Green innovation -> sustainable performance	0.167	1,011	0.156	Not accepted
H6	knowledge management -> sustainable performance	0.254	1,753	0.040	Accepted

The hypothesis testing results presented in this study examine different relationships in the context of sustainable business performance. The initial hypothesis (H1) posits a substantial and positive correlation between competitive advantage and

sustainable performance, which is reinforced by a substantial coefficient of 0.329, a high T-statistic of 2.742, and a low p-value of 0.003, thus signaling considerable statistical significance. This suggests that businesses that possess a competitive advantage are more inclined to attain long-term success.

On the other hand, hypothesis H2 investigates the correlation between green supply chain management and sustainable performance, indicating a coefficient of 0.075, a T-statistic of 0.392, and a p-value of 0.347, suggesting that there is no noteworthy link between green supply chain management and sustainable performance. This indicates that although incorporating environmentally friendly measures in the supply chain can contribute to sustainability, it not necessarily result in improved overall performance.

Transitioning to hypothesis H3, which examines the correlation between green innovation and green supply chain management, reveals a notable coefficient of 0.419, a substantial T-statistic of 2.418, and a minimal p-value of 0.008, suggesting a statistically significant favorable association between green innovation and the implementation of environmentally friendly practices within the supply chain. This emphasizes the significance of incorporating innovative practices in fostering sustainability efforts in the supply chain.

In a similar vein, hypothesis H4 explores the connection between knowledge management and green supply chain management, demonstrating a substantial positive correlation with a coefficient of 0.493, a high T-statistic of 2.830, and a low p-value of 0.002. This implies that the implementation of efficient knowledge management practices greatly aids in the acceptance and execution of environmentally friendly strategies across the supply chain, thereby advancing sustainability initiatives.

Additionally, hypotheses H5 and H6 aim to investigate the direct connections between green innovation and knowledge management, individually, with sustainable performance. Although both demonstrate positive coefficients of 0.167 and 0.254, as well as moderate T-statistics and p-values, they do not achieve the same degree of statistical

significance observed in H1, H3, and H4. Green innovation has no effect on sustainable performance but knowledge management has effect on it.

Table 8. Indirect Effect Result

Hypot hesis	Relationship	Original sample	T statistics	P values	Result
H7	Green innovation -> green supply chain management -> sustainable performance	0.031	0.370	0.356	Not accepted
H8	knowledge management -> green supply chain management -> sustainable performance	0.037	0.350	0.363	Not accepted

Hypothesis H7 posits that the impact of green innovation on sustainable performance is mediated by its influence on green supply chain management. The findings of this study show that the coefficient of 0.031, a T-statistic of 0.370, and a p-value of 0.356 suggest an absence of statistical significance in the relationship between green innovation and sustainable performance through green supply chain management. This suggests that while green innovation play a role in fostering the implementation of eco-friendly practices in the supply chain, it does not have a substantial effect on sustainable performance through this avenue.

In the same vein, hypothesis H8 suggests that the impact of knowledge management on sustainable performance is mediated by its influence on green supply chain management. The correlation between knowledge management and sustainable performance through green supply chain management is not deemed statistically significant, as evidenced by a coefficient of 0.037, a T-statistic of 0.350, and a p-value of 0.363. This indicates that although the implementation of knowledge management practices can have an effect on the adoption of environmentally friendly strategies in the supply chain, it does not have a substantial impact on sustainable performance via this intermediated route.

c. Discussion

Competitive Advantage Has Effect on Sustainable Performance

The competitive advantage is essential in influencing the long-term performance of Small and Medium Enterprises (SMEs) in the city of Malang (Rokhman 2023). In the dynamic and competitive economic environment, characterized by the proliferation of small and medium-sized enterprises across diverse sectors, establishing a competitive advantage is imperative for sustained viability and expansion. Having a unique competitive edge allows small and medium-sized enterprises (SMEs) to set themselves apart from their rivals, making it possible for them to draw in and keep customers while also charging premium prices for their offerings. This serves to not only increase income, but also promotes sustained stability. Furthermore, SMEs can solidify their position in the market by capitalizing on their distinct advantages, such as innovation, cost effectiveness, or exceptional customer service. This can serve as a deterrent for new competitors and decrease the possibility of substitutes posing a threat. As a result, maintaining a competitive advantage over time results in enhanced financial performance, operational effectiveness, and the ability to withstand market fluctuations, thus ultimately contributing to the overall sustainability of small and medium-sized enterprises in the city of Malang. By engaging in strategic planning and ongoing innovation, small and medium-sized enterprises (SMEs) have the potential to leverage their competitive edge in order to effectively address obstacles, capitalize on prospects, and prosper within the ever-changing business landscape of Malang city (Puspaningrum 2020).

Green Supply Chain Management Has No Effect on Sustainable Performance

The idea that implementing green supply chain management does not impact sustainable performance can be a topic of debate within discussions on sustainability. Green supply chain management (GSCM) involves the incorporation of environmental considerations into the operations of supply chain management. The main objective of this initiative is to minimize the ecological footprint across the complete supply chain life

cycle, encompassing product development, material acquisition, production, distribution, and disposal at the end of its useful life(Das et al. 2023).

Supporters of green supply chain management assert that it is vital for improving sustainable performance. Through the adoption of eco-friendly initiatives such as energy-efficient transportation, waste minimization, and the utilization of sustainable materials, businesses have the potential to reduce their environmental impact and consumption of resources. Consequently, this can result in reduced expenses, enhanced corporate image, and minimized legal compliance challenges. Additionally, the implementation of Green Supply Chain Management (GSCM) practices has the potential to stimulate creativity and facilitate the advancement of environmentally friendly technologies and products, thereby making a significant contribution to the promotion of sustainable practices in the long term(Khan et al. 2024).

Nonetheless, opponents argue that in specific circumstances, the effect of GSCM on sustainable performance may be restricted or minimal. The authors contend that although green supply chain management (GSCM) efforts could result in enhancements in certain environmental metrics, like decreased greenhouse gas emissions or water consumption, they may not necessarily result in more comprehensive sustainable achievements. Elements such as the behavior of consumers, market dynamics, regulatory frameworks, and the complexity of the supply chain can impact the efficacy of green supply chain management (GSCM) efforts and their capacity to instigate significant change(Hejazi, Al Batati, and Bahurmuz 2023).

Moreover, certain analysts contend that the implementation of green supply chain management (GSCM) initiatives could potentially be hindered by the presence of trade-offs or unforeseen repercussions. An instance of this would be when a company places emphasis on a single environmental issue, such as decreasing carbon emissions, while unintentionally disregarding other elements of sustainability, such as social equality and the preservation of biodiversity. Additionally, the integration of Green Supply Chain Management (GSCM) principles may involve initial expenses or necessitate compromises

with alternative business goals, which could potentially impede their uptake or impact(Dzikriansyah et al. 2023b).

Moreover, the impact of GSCM on sustainable performance could differ depending on the industry, geographical location, and specific organizational circumstances. Some businesses may experience substantial advantages from Green Supply Chain Management (GSCM) efforts, while others may encounter challenges in overcoming obstacles such as constrained resources, inadequate support from stakeholders, or conflicting priorities. Furthermore, the intricate nature of international supply networks and the interdependence of economic, social, and environmental elements can present difficulties in accurately assessing and appraising the influence of Global Supply Chain Management (GSCM) on sustainable performance(Rizki, Murwaningsari, and Sudibyو 2022).

SMEs often face cost constraints that hinder their ability to invest in green technologies, processes, and training. The initial investments required for implementing GSCM practices can be substantial, and SMEs in Malang, like many others, may have limited financial resources, making it challenging to adopt and maintain these practices effectively. Secondly, there might be a lack of awareness and expertise among SMEs regarding GSCM. Without proper understanding and skilled personnel, the adoption of green practices may not translate into tangible improvements in sustainable performance. Moreover, the market dynamics in Malang may not sufficiently reward green practices. If consumers and business partners do not prioritize or demand sustainable products, SMEs have little incentive to invest in GSCM, thus limiting its impact on their performance.

Additionally, the local regulatory environment may not enforce or incentivize green practices strongly. In the absence of stringent regulations or incentives from the government, SMEs may not feel compelled to implement GSCM, reducing its overall effectiveness on sustainable performance. Furthermore, effective GSCM requires a high level of integration and collaboration across the supply chain. SMEs often operate with fragmented supply chains and have less influence over their suppliers, making it difficult to implement comprehensive green supply chain initiatives. Resistance to change within the organization can also be a significant barrier. Employees and management might be

resistant to adopting new, green practices due to a lack of understanding of their benefits or due to entrenched traditional practices. Moreover, SMEs might struggle with measuring the impact of GSCM practices on sustainable performance. Without clear metrics and measurement tools, it is difficult to assess the benefits, leading to scepticism about the effectiveness of GSCM. Lastly, SMEs often operate with a short-term focus due to survival pressures and immediate financial goals. GSCM practices typically yield benefits in the longer term, which may not align with the short-term priorities of these businesses.

The results in a study showed that green supply chain management practices did not have a direct impact on environmental performance. The results go against the idea that green performance can be enhanced through GSCM. The cause of this outcome could be ' the respondents did not provide an appropriate response(Rehman et al. 2023). Another research claimed that SMEs often operate with limited financial resources, making it challenging to invest in green technologies and practices. Implementing GSCM can require significant upfront costs, which many SMEs cannot afford. Additionally, SMEs typically have smaller workforces with less specialized expertise in environmental management compared to larger firms. This limits their ability to implement and manage GSCM initiatives effectively. Access to advanced technologies that facilitate GSCM practices can also be limited for SMEs. Without the right technology, it becomes difficult to monitor, manage, and improve supply chain sustainability(Lee and Klassen 2008).

Moreover, many SMEs lack awareness of the benefits and practices associated with GSCM. This can stem from inadequate access to information and insufficient training or education on sustainability issues. Even when aware, SMEs might not have the necessary knowledge to effectively implement GSCM practices. This includes understanding how to integrate sustainability into their supply chain and measure its impact(Agyemang et al. 2018). Another significant factor is the position and power dynamics within the supply chain. SMEs often have less bargaining power compared to larger firms, which limits their ability to influence suppliers or customers to adopt green practices, thereby reducing the overall effectiveness of their GSCM initiatives. Additionally, many SMEs are suppliers to larger companies and may be constrained by the sustainability practices (or lack thereof) of

these larger firms. Their ability to implement GSCM is often influenced by the demands and practices of their larger partners(Zhu and Sarkis 2006).

Green Innovation Has Effect on Green Supply Chain Management

The incorporation of green innovation significantly influences the functioning and development of green supply chain management within the urban context of Malang City. Malang, as it develops into a larger urban hub, is confronted with issues characteristic of contemporary cities, including environmental deterioration and the exhaustion of natural resources. As a reaction, there has been a rise in green innovation efforts, which are propelled by a combination of government policies and private sector initiatives. These advancements encompass a wide range of industries, such as renewable energy, waste management, transportation, and manufacturing techniques(Gibral, Zulfikarijah, and Firdaus 2022).

The impact of green innovation on supply chain management in Malang City is underscored by a strong focus on sustainability across the entire supply chain. Corporations are progressively integrating eco-friendly methods into their procurement, manufacturing, distribution, and waste management procedures. The transition towards sustainability is motivated not only by legal mandates but also by the increasing consumer preference for environmentally responsible goods and services. Consequently, companies are implementing environmentally friendly measures including the reduction of carbon emissions, the minimization of waste generation, and the procurement of materials from sustainable suppliers(Ahmad et al. 2022).

Furthermore, green innovation encourages cooperation among stakeholders throughout the supply chain. In Malang City, collaborative efforts between governmental entities, private enterprises, academic institutions, and non-governmental organizations have been established to advocate for sustainable methodologies and innovations. The cooperation between entities enables the exchange of knowledge, transfer of technology, and development of capabilities, all of which are crucial for fostering innovation and

surmounting challenges in green supply chain management(Rakhmawati, Rahardjo, and Kusumawati 2019).

One additional consequence of the implementation of environmentally friendly innovation is the integration of novel technologies and methods to improve the efficiency and robustness of supply chains. One example can be seen in the integration of technological advancements such as blockchain, Internet of Things (IoT) sensors, and data analytics, which allows for enhanced product tracking and tracing, improved transportation routes, and immediate environmental impact monitoring. Utilizing these technologies can enable businesses in Malang City to enhance the efficient use of resources, lower expenses, and alleviate the potential risks related to climate change and natural disasters(Roz et al. 2023).

Moreover, the implementation of green innovation not only enhances economic growth, but also fosters the emergence of novel prospects for businesses within the city of Malang. As corporations allocate resources to renewable energy, eco-friendly infrastructure, and sustainable production techniques, they not only generate employment opportunities but also draw in financial support and foster the development of innovation ecosystems. Local startup companies and individuals who start businesses are placing more emphasis on creating environmentally friendly technologies and solutions to tackle environmental problems, which in turn is accelerating the shift towards an economy that is focused on sustainability and reducing its impact on the environment(Cahyasari 2021).

Knowledge Management Has Effect on Green Supply Chain Management

Knowledge management has a significant impact on shaping the adoption of environmentally sustainable practices within the supply chain of Small and Medium Enterprises (SMEs) situated in Malang City. Small and medium-sized enterprises frequently encounter difficulties when trying to incorporate sustainable initiatives as a result of their constraints in terms of resources, knowledge, and understanding. Nevertheless, through efficient management of knowledge pertaining to environmentally friendly initiatives, these enterprises are capable of overcoming obstacles and maximizing

the efficiency of their supply chains in order to promote environmental sustainability(Susilowati and Barinta 2024).

A notable impact of knowledge management on green supply chain management within small and medium enterprises (SMEs) in Malang City involves the sharing of best practices and acquired knowledge. SMEs can gain knowledge about sustainable supply chain strategies, including eco-friendly packaging, energy-efficient production processes, and responsible sourcing, through information-sharing platforms, workshops, and training programs. Using this expertise, small and medium-sized enterprises (SMEs) can recognize areas for enhancement and integrate economical strategies to lessen their impact on the environment(Gibral et al. 2022).

Additionally, knowledge management supports the cooperation and connection among small and medium-sized enterprises (SMEs), as well as with larger corporations, research institutions, and government agencies. In Malang City, efforts such as the establishment of industry clusters, business associations, and innovation hubs serve as venues for the exchange of ideas, experiences, and resources pertaining to green supply chain management. Engaging in these networks allows small and medium-sized enterprises to gain valuable insights from one another's achievements and setbacks, establish collaborations to execute collaborative sustainability initiatives, and utilize resources and funding prospects(Purwoko et al. 2023).

Moreover, knowledge management allows small and medium-sized enterprises (SMEs) to stay updated on regulatory mandates and market developments pertaining to environmental sustainability. In the city of Malang, there is a growing emphasis on eco-friendly products and practices due to government regulations and consumer preferences. In order to remain competitive, small and medium-sized enterprises (SMEs) must keep up with evolving standards and expectations. By proficiently controlling knowledge via various channels such as industry associations, online databases, and regulatory updates, small and medium-sized enterprises (SMEs) can guarantee adherence to environmental regulations and forecast the market's need for sustainable products and services(Cahyasari 2021).

Furthermore, knowledge management enables small and medium-sized enterprises to drive innovation and create novel environmentally-friendly technologies and business strategies. By promoting an environment that encourages originality and inventive thinking, small and medium-sized enterprises in Malang City have the opportunity to investigate innovative methods for maintaining sustainable supply chain management. This can include the adoption of circular economy principles, implementation of product-service systems, and utilization of green logistics solutions. By engaging in research and development initiatives, collaborating with academic institutions, and taking part in innovation competitions, small and medium-sized enterprises (SMEs) are able to acquire specialized knowledge and resources necessary for promoting environmentally-friendly innovation, and ultimately, attain a competitive advantage in the market (Susilowati and Barinta 2024).

Green Innovation Has No Effect on Sustainable Performance

The correlation between environmentally-friendly innovation and the long-term effectiveness of Small and Medium Enterprises (SMEs) in Malang City is a multifaceted interaction involving numerous elements. At first, the idea of green innovation shows potential as a means to achieve environmental sustainability. This implies that small and medium-sized enterprises (SMEs) can enhance their overall performance and lessen their environmental impact by implementing eco-friendly practices. Nevertheless, within the framework of Malang City's small and medium enterprise (SME) environment, this connection may not exhibit the anticipated directness (Sunaryo 2020).

There are various factors that hinder the full potential of environmentally-friendly innovation in small and medium-sized enterprises (SMEs) in Malang City, thus affecting their overall sustainability. Initially, it is important to acknowledge the inherent difficulties associated with adopting environmentally conscious practices within small and medium-sized enterprises (SMEs). Challenges often encountered by small and medium enterprises (SMEs) in emerging economies such as Indonesia include financial limitations, a shortage of technical knowledge, and restricted availability of environmentally friendly technologies. While acknowledging the significance of sustainability, numerous small and

medium-sized enterprises (SMEs) in Malang City encounter challenges in efficiently allocating resources for the implementation and incorporation of environmentally friendly innovations into their business practices(Cahyasari 2021).

Furthermore, the regulatory framework and institutional backing are crucial factors that influence the capacity of small and medium-sized enterprises to adopt and uphold sustainable business practices. Despite making progress in the establishment of environmental regulations, Indonesia still faces challenges when it comes to enforcement, with inconsistent application across the country. Additionally, smaller enterprises may find it financially burdensome to comply with these regulations. Furthermore, the presence of support systems such as government incentives, technical support, and the opportunity to access eco-friendly financing choices can significantly impact small and medium-sized enterprises' ability to adopt sustainable innovation. The effectiveness of support systems in Malang City may differ, which can affect small and medium-sized enterprises' capacity to invest in and gain advantages from eco-friendly initiatives(Weitzel and Mccarthy 2013).

Moreover, the incentives for small and medium-sized enterprises (SMEs) to prioritize sustainability can be influenced by consumer demand and market dynamics. The rise of environmentally friendly consumer behavior on a global scale may not necessarily result in significant market prospects for small and medium-sized enterprises (SMEs) in Malang City. Elements like cost sensitivity, distinctiveness of the product, and awareness of consumers play a crucial role in influencing the market demand for environmentally friendly products and services, which in turn impacts the Small and Medium Enterprises' (SMEs) inclination towards investing in sustainable innovation. In a competitive market setting where cost concerns frequently hold more weight, small and medium-sized enterprises (SMEs) may give greater importance to achieving short-term profitability as opposed to long-term sustainability objectives(Park, Jo, and Ryu 2021).

Furthermore, the larger socio-economic environment in which small and medium enterprises (SMEs) function can impact their attitude towards sustainability. Phenomena such as the cultural perspectives on environmental preservation, the dynamics of local supply chains, and the presence of competent labor can all influence the capacity of small

and medium-sized enterprises to efficiently adopt environmentally-friendly practices. It is essential to carefully take into account the contextual factors in Malang City, which may vary from other regions, when assessing the correlation between green innovation and sustainable performance in small and medium-sized enterprises (SMEs)(Mediaty, Diza Kurnianty Jamal, and Abdul Hamid Habbe 2023).

Many SMEs prioritize immediate economic performance over long-term sustainability goals. This focus on short-term economic gains often leads to inadequate investment in green innovation, which requires a longer-term commitment to realize environmental and economic benefit(Rustiarini et al. 2022). SMEs typically face limitations in financial and human resources, which can hinder the implementation of green innovation practices. These enterprises may lack the necessary capital to invest in new technologies and the skilled personnel needed to manage and implement green initiatives effectively(Lestari and Sunyoto 2023). There is often a gap in awareness and understanding of the benefits of green innovation among SME owners and managers. Without a clear understanding of how green practices can enhance sustainability and competitiveness, these businesses may be reluctant to adopt such measures(Rodrigues and Franco 2023). Even when there is an intent to implement green innovation, operational challenges can impede progress. SMEs might find it difficult to integrate sustainable practices into their existing business models due to the complexity and costs involved (Baeshen, Soomro, and Bhutto 2021). Organizational culture and structural rigidity can also play a role. In many cases, traditional business practices and resistance to change within the organization can limit the adoption of innovative green practices(Baeshen et al. 2021).

Knowledge Management Has Effect on Sustainable Performance

Knowledge management is a crucial factor in improving the long-term success of small and medium-sized enterprises (SMEs) located in Malang City. The concept of knowledge management encompasses the processes of capturing, exchanging, and applying the collective knowledge of an organization in order to enhance its efficiency, innovation, and competitive advantage. In the context of small and medium-sized

enterprises (SMEs), where resources may be constrained, the implementation of efficient knowledge management (KM) practices can offer a strategic edge by capitalizing on existing knowledge assets and nurturing a culture of continuous learning and adaptability(Balcerzyk 2020).

Enhanced decision-making processes are one of the ways in which knowledge management (KM) influences the sustainable performance of small and medium enterprises (SMEs). Through the consolidation and centralization of knowledge resources, small and medium-sized enterprises (SMEs) have the ability to make well-informed decisions utilizing data-driven insights and previous experiences. This process assists in the reduction of mistakes, the allocation of resources in an efficient manner, and the identification of potential areas for expansion. In the city of Malang, small and medium-sized enterprises play a crucial role in the local economy. Making well-informed decisions can result in the development of stronger businesses that are more capable of overcoming obstacles and taking advantage of new opportunities(Ayu Rigan and Parahiyanti 2022).

Additionally, Knowledge Management encourages innovation within Small and Medium Enterprises (SMEs) by enabling the creation and exchange of knowledge among staff members. In a dynamic business landscape, small and medium-sized enterprises (SMEs) must prioritize innovation in order to remain competitive and effectively respond to evolving market dynamics. Aiding the fostering of teamwork and communication across different departments, knowledge management (KM) empowers small and medium-sized enterprises (SMEs) in Malang City to utilize the combined expertise of their employees, consequently driving the innovation of fresh products, services, and methodologies. This not only strengthens the value proposition of small and medium-sized enterprises, but also plays a role in the long-term growth of the regional economy by promoting a culture of innovation and business acumen(Ayu Rigan and Parahiyanti 2022).

Furthermore, the implementation of efficient knowledge management practices also helps in fostering the growth of intellectual resources in small and medium-sized enterprises. SMEs can empower their employees to improve their performance by investing in training and development programs that emphasize sharing knowledge and

enhancing skills. This doesn't just boost employee happiness and keep them from leaving, but it also helps to preserve the organization's collective knowledge over time. In Malang City, the improvement of human capital through knowledge management initiatives can have a beneficial effect on the long-term sustainability of small and medium-sized enterprises (SMEs) and the surrounding community. Skilled labor is crucial for driving economic growth in the city (Apriliadi 2019).

In addition, KM helps small and medium-sized businesses in Malang City to become more resilient by supporting their organizational learning and ability to adapt. SMEs face a range of internal and external challenges, including technological advancements, regulatory changes, and market fluctuations, in today's rapidly evolving business environment. By methodically collecting and examining knowledge gained from previous experiences, small and medium-sized enterprises (SMEs) can glean insights from both their triumphs and setbacks, allowing them to adjust their strategies and procedures accordingly. The ongoing process of learning not only enhances the ability of small and medium-sized enterprises to bounce back from challenges, but also encourages a culture of ongoing growth and creativity, leading to consistent success in the long run (Durst, Foli, and Edvardsson 2024).

Green Supply Chain Management Does Not Mediate Between Green Innovation and Sustainable Performance

The lack of mediation between green innovation and sustainable performance via green supply chain management in Small and Medium-sized Enterprises (SMEs) in Malang can be attributed to several plausible reasons. Firstly, SMEs face unique challenges in implementing green supply chain practices compared to larger enterprises, such as limited resources, expertise, and bargaining power with suppliers. As a result, the influence of green innovation on sustainable performance not fully translate into improved supply chain practices within SMEs due to these constraints (Aprilia et al. 2023).

Moreover, the nature of green innovation itself could play a role. While green innovation lead to the development of environmentally friendly products or processes, its

direct impact on supply chain management practices, particularly in SMEs, not be immediate or straightforward. Green innovations might focus more on product design or manufacturing processes rather than extending to the entire supply chain, thereby limiting the mediating effect of green supply chain management on sustainable performance. Additionally, the market context in Malang, Indonesia, where these SMEs operate, could influence the dynamics between green innovation, supply chain management, and sustainable performance. Factors such as consumer preferences, regulatory frameworks, and the availability of green technology and infrastructure vary, affecting the adoption and effectiveness of green supply chain practices as a mediator (Rofiaty et al. 2024). Furthermore, the organizational culture and priorities within SMEs might not prioritize green supply chain management as a strategic pathway for enhancing sustainable performance. Limited awareness or understanding of the potential benefits of integrating green practices throughout the supply chain, combined with competing business priorities, could diminish the perceived importance of investing resources in this area (Epo and Mafini 2018).

green innovation can directly impact sustainable performance by introducing new products, processes, or technologies that inherently improve environmental and economic outcomes. Innovations such as energy-efficient technologies or waste reduction processes can directly enhance sustainability without necessarily requiring changes in the supply chain. The benefits of green innovation can be more immediate and observable in terms of resource savings, emission reductions, and compliance with environmental regulations, thus directly influencing sustainable performance metrics (Chen et al. 2006). The complexity of implementing GSCM presents significant challenges. Operational changes in procurement, production, distribution, and reverse logistics require substantial coordination, investment, and time, potentially delaying the realization of sustainable performance benefits. Additionally, firms may face resistance from suppliers or lack the capability to enforce green practices across the supply chain, which can hinder the effectiveness of GSCM as a mediator between green innovation and sustainable performance (Zuhsarkislaei n.d.).

Integration and alignment issues also play a crucial role. The goals of green innovation and GSCM might not always align perfectly. For example, a firm might innovate in areas that do not align with its supply chain practices, leading to a disconnect. In some cases, green innovation efforts might be concentrated in specific areas of the business, while GSCM requires a holistic and integrated approach across all supply chain activities. Measurement and evaluation challenges further complicate the relationship. The metrics used to evaluate green innovation, such as reduced carbon footprint and energy efficiency, might differ from those used to assess GSCM, like supplier compliance and green logistics performance. This discrepancy can make it difficult to establish a clear mediating relationship. Additionally, the effects of GSCM on sustainable performance might be lagged or indirect, making it challenging to capture the mediation effect in empirical studies (Gimenez and Tachizawa 2012).

Green Supply Chain Management Does Not Mediate Between Knowledge Management and Sustainable Performance

The lack of mediation between knowledge management and sustainable performance in Small and Medium Enterprises (SMEs) in Malang, Indonesia, by Green Supply Chain Management (GSCM) could stem from various factors (Susilowati and Barinta 2024). Firstly, while knowledge management fosters the accumulation and dissemination of information crucial for sustainable practices, its implementation might not be directly tied to GSCM strategies in SMEs. In other words, SMEs might possess knowledge regarding sustainability but struggle to integrate it effectively into supply chain operations due to resource constraints or lack of awareness about GSCM practices. Additionally, the absence of mediation could point to the underdevelopment or limited adoption of GSCM frameworks within the SME landscape in Malang. It's possible that SMEs prioritize other aspects of their operations over green initiatives due to perceived costs or lack of regulatory pressure. Moreover, institutional support and collaboration among stakeholders might be insufficient to facilitate the seamless integration of knowledge management and GSCM practices, further hindering the mediation effect. Overall, while knowledge management is foundational for sustainable performance, its

impact may not fully translate into tangible outcomes without robust GSCM mechanisms in place, highlighting the need for tailored strategies and increased awareness among SMEs in Malang(Sisca and Wijaya 2023).

Knowledge Management (KM) involves the strategies and processes designed to identify, capture, structure, value, leverage, and share an organization's intellectual assets to enhance its performance and competitiveness. KM directly influences the sustainable performance of SMEs. Effective KM practices can lead to better decision-making, innovation, and efficiency, all of which contribute to sustainability. This direct impact suggests that SMEs with robust KM practices are likely to perform better in terms of sustainability, regardless of their GSCM practices(Malhotra and Segars 2014). Sustainable Performance refers to the ability of an organization to operate in a manner that ensures long-term business success while considering its environmental, social, and economic impacts. Green Supply Chain Management (GSCM) integrates environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final product, and end-of-life management of the product after its useful life(Srivastava 2007).

Green supply chain management is typically expected to mediate the relationship between KM and sustainable performance, meaning that KM would enhance GSCM practices, which in turn would improve sustainable performance. However, the study suggests that in the context of SMEs in Malang City, GSCM does not serve this mediating role. This could be due to several reasons: Limited Implementation of GSCM, where SMEs in Malang might not have fully integrated GSCM practices due to resource constraints or lack of awareness; the Direct Impact of KM, where the impact of KM on sustainable performance might be so strong that it overshadows the role of GSCM as a mediator; and Contextual Factors, where specific local factors in Malang City, such as the regulatory environment, market conditions, or cultural aspects, might influence the effectiveness of GSCM differently compared to other regions(Govindan et al. 2014; Yadav and Desai 2016).

J. Conclusion

In summary, the complex interplay between competitive advantage, green innovation, knowledge management, green supply chain management, and sustainable performance in Small and Medium-sized Enterprises (SMEs) in Malang, Indonesia, demonstrates intricate dynamics. The direct impact of competitive advantage and knowledge management on sustainable performance is evident, whereas the influence of green supply chain management as a mediator between green innovation and sustainable performance appears to be minimal within this specific framework. The absence of intervention indicates that the incorporation of environmentally friendly practices in the management of supply chains may not be widespread or efficient among small and medium-sized enterprises in Malang. Moreover, it seems that the impact of green innovation on sustainable performance is not direct, which may be attributed to difficulties in implementing innovative environmentally friendly solutions throughout the entire supply chain. Hence, in order to improve the long-term viability of small and medium-sized enterprises (SMEs) in Malang, it is crucial to develop custom-tailored approaches that specifically target the obstacles hindering the implementation of environmentally-friendly supply chain practices. This includes efforts to enhance the dissemination and incorporation of knowledge related to sustainability, as well as emphasizing the importance of integrating sustainability objectives alongside competitive advantage considerations.

K. Managerial Implication

SMEs should critically assess their Green Supply Chain Management (GSCM) practices, as current efforts may not be contributing to sustainable performance. It is important to understand specific areas within the supply chain where environmental practices could be more effectively implemented. By identifying and addressing gaps, SMEs can enhance their environmental impact and operational efficiency. Although current green innovations might not directly impact sustainable performance, they remain essential for long-term competitiveness and regulatory compliance. SMEs should continue to invest in green innovation but also seek to align these innovations more closely with

overall business goals. This alignment can ensure that green initiatives contribute more directly to sustainable outcomes.

Since GSCM does not mediate between knowledge management and sustainable performance, SMEs should focus on strengthening their knowledge management systems independently. Effective knowledge management involves better capturing, sharing, and utilizing knowledge to drive innovation and performance improvements. This can create a more agile and informed organization capable of adapting to changing market conditions. Integrating sustainability into core business strategies is crucial. Instead of relying solely on GSCM and green innovation, SMEs should adopt broader sustainability practices that encompass social and economic dimensions alongside environmental ones. This holistic approach can lead to more balanced and sustainable growth. Implementing robust metrics to regularly monitor and measure the impact of sustainability initiatives is essential. This practice helps in identifying which strategies are truly effective and allows for necessary adjustments. Continuous improvement in sustainability practices can lead to better long-term results.

Finally, SMEs should engage with other businesses, industry groups, and academic institutions to share best practices and learn from successful sustainable practices. Collaboration can lead to better strategies that are more effective in the local context. By leveraging collective knowledge and experiences, SMEs in Malang can enhance their sustainable performance and overall competitiveness.

Nevertheless, the minimal impact of green supply chain management in mediating the relationship between green innovation and sustainable performance underscores the necessity for reassessment and adjustment of supply chain strategies. Small and medium-sized enterprises (SMEs) need to prioritize addressing obstacles to implementing environmentally-friendly supply chain practices, such as financial limitations and lack of knowledge, by employing tailored programs to enhance their abilities and forming advantageous alliances. Furthermore, the closer alignment of green innovation initiatives with supply chain processes can help ensure the smooth incorporation of eco-friendly solutions across the entire value chain, thereby promoting sustainable performance.

Essentially, the managerial recommendation is that small and medium-sized enterprises (SMEs) in Malang should incorporate a comprehensive strategy that integrates knowledge management, green innovation, and supply chain management in order to enhance their sustainable performance. By considering these interrelated elements, small and medium-sized enterprises (SMEs) have the potential to not only lessen environmental effects, but also improve their operational effectiveness and ability to withstand challenges in a progressively competitive market environment.



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