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Green Supply Chain Management Adoption's Internal and External Barriers in Malaysia Construction Industry: A Case Study

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Abstract: The construction industry has significantly strengthened Malaysia's economy; however, its swift growth has also influenced the environment and could potentially impact the population. The Malaysian government has committed to promoting the adoption of sustainable practices among construction companies nationwide. Although Green Supply Chain Management (GSCM) has been introduced over the past decade, the majority of construction companies in Malaysia still have not adopted GSCM practices within the construction industry. This qualitative study aimed to pinpoint the internal and external obstacles to the implementation of GSCM. Focusing on the Malaysian construction industry, the research employed a qualitative methodology. Purposive sampling was used to select twelve managerial-level participants from various stakeholders, including clients, contractors, government officers, and consultants. Semi-structured face-to-face interviews served as the primary method for data collection, and the gathered information was meticulously analyzed using a thematic analysis approach. The findings of this study revealed four internal obstacles that organisations face: operational disruption, lack of awareness, lack of knowledge and expertise, and high initial costs. On the other hand, the study revealed five external challenges: insufficient coordination, low market demand, regulatory and policy barriers, and a lack of government incentives. The comprehensive findings and discussions presented in this study are expected to contribute positively to ongoing efforts in implementing GSCM within the Malaysian construction sector, providing valuable insights for policymakers and industry practitioners.

Keywords: *Construction Industry, Green Supply Chain Management, Qualitative, Case Study, Malaysia*

1. Introduction and Background

The social and economic development of the country is significantly influenced by the construction sector (Ramiah, 2019). Considering that the construction sector is an essential part of any economy (Masyhur et. al, 2024; Waqar et. al, 2024), it is essential to the advancement of a country and should not be undervalued (Rashid et. al, 2024). Malaysia's construction industry has contributed between 4.5% and 5% of the country's GDP in recent years. This percentage demonstrates the sector's significant contribution to Malaysia's economic expansion, which has been driven by investments in residential construction and infrastructure. After the pandemic caused disruptions, private sector investments resumed, and the industry saw a resurgence in 2023. (MIDF Research, 2024).

Increased air and water pollution, deforestation, and biodiversity loss are the results of growing urbanization and industrialization (Sikder et. al, 2022; Voumik & Sultana,2022). Furthermore, extreme weather events and rising global temperatures are unmistakable signs of how human activity is affecting the environment. Approximately 50% of landfill waste, 40% of global energy consumption, and 50% of climate change are caused by the construction industry (Saxena, 2025; Ting, Zandi & Shahzad, 2025). Additionally, the construction sector contributes to the degradation of natural habitats and pollution of the air, water, and noise. According to the World Economic Forum (WEF) report, many nations may be able to significantly reduce their emission rates and achieve energy savings of more than 30% thanks to the construction industry's capabilities (Sandanayake, 2022).

The Malaysian construction industry has taken a number of steps to create opportunities for environmentally friendly building methods. The New Economic Policy (NEP) initiated sustainable development in the 1970s, and the five-year Malaysia Plan included certain sustainable elements (Awwad, 2021). Founded in 2007 and formally constituted in 2009, the Malaysia Green Building Confederation (MGBC) is dedicated to governing sustainable development in Malaysia (Green Building Council of Malaysia, 2023).

As businesses look to reduce their environmental impact and operate sustainably, green supply chain management, or GSCM, has grown in importance (Feng, Lai & Zhu, 2022; Zhu et al., 2011). Green supply chain management, or GSCM, is essential in Malaysia for promoting sustainability and influencing business practices.

Many businesses have adopted green supply chains to address various environmental issues, such as pollution reduction and energy conservation. These tactics include creating networks of suppliers to obtain environmentally superior products and creating conventional techniques for waste reduction and operational efficiency (Kumar & Chandrakar, 2021; 2012).

GSCM in the construction sector means using ecologically friendly methods across the supply chain, from getting raw materials to building, moving things around, and getting rid of waste (Fu, Liu, & Shan, 2023; Wong, Wah, & Wong, 2023). The goal is to keep the project on track and of high quality while having as little of an effect on the environment as possible. This means utilizing products that are good for the environment, cutting down on energy use and pollution, properly disposing of waste, and choosing suppliers who respect environmental rules. GSCM also promotes "lifecycle thinking," which is taking environmental factors into account from the design stage all the way through to the building's operations (Soufi et. al, 2023). It helps construction companies follow the rules, get green certifications, and work toward national goals for sustainability.

The organization examined in this analysis has established a robust reputation as a key player in Malaysia's construction and infrastructure sectors. The organization has consistently demonstrated its capability in executing projects punctually and adhering to the highest quality benchmarks, particularly focusing on infrastructure development, construction initiatives, and public amenities. The company, as a CIDB G7 contractor, holds the pinnacle of certification within the construction industry.

This G7 classification granted by the Construction Industry Development Board (CIDB) Malaysia permits contractors to bid on projects of limitless value, signifying substantial financial capability, technical proficiency, and a demonstrated history of performance. G7 contractors are authorized to execute projects over RM10 million, with no maximum limit on contract amount. This allows for the execution of comprehensive and significant projects that greatly enhance the nation's progress.

Although the construction sector plays a vital role in Malaysia's economic growth and strives for sustainable practices, the implementation of Green Supply Chain Management (GSCM) is still quite restricted. Despite the introduction of initiatives like Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCREST), the Green Building Index (GBI), and the Construction Industry Transformation Program (CITP) aimed at promoting green construction, the sector still encounters considerable challenges.

Organizations face challenges related to the elevated expenses of sustainable materials, a lack of awareness, and a deficiency in knowledge regarding environmentally friendly practices (Soufi et. al, 2023; Wong, Wah & Wong, 2023). Weak policy enforcement, minimal government incentives, and fragmented collaboration among stakeholders externally hinder the effective implementation of GSCM (Oyefusi, Enegbuma, & Brown, 2025; Ahmed et. al, 2023). The presence of these obstacles plays a significant role in the ongoing environmental deterioration within the industry, characterized by elevated carbon emissions, substantial energy use, and increased waste production.

Given the organization’s prominent role in delivering large-scale construction and infrastructure projects in Malaysia, it serves as a representative case for examining the broader industry’s readiness to adopt sustainable practices. Investigating both internal and external barriers to Green Supply Chain Management (GSCM) within this organization provides valuable insight into the practical challenges faced by major players in the sector. By identifying and understanding these barriers, the study aims to highlight actionable strategies that can facilitate more effective integration of GSCM in Malaysia’s construction industry, particularly among top-tier contractors, where change can create wider systemic impact.

2. Literature Review

While the concept of Green Supply Chain Management (GSCM) has gained increasing attention globally, there remains a notable paucity of empirical studies examining its adoption within the Malaysian construction industry, particularly in the post-pandemic context. Most existing research (Kazemi et al., 2023; Chen, Feng, & de Soto, 2022; Shekarian et. al, 2022; Lima et al., 2021) in the field has primarily focused on general sustainable construction practices, environmental performance metrics, and green building technologies, with limited emphasis on the comprehensive integration of GSCM principles.

Green Supply Chain Management Adoption

Few studies (Khayyat et. al, 2024; Kazemi, 2023; Feng, Lai & Zhu, 2022; Hebaz & Oulfarsi, 2021; Badi & Murtagh, 2019) have systematically explored the internal and external barriers that hinder GSCM adoption, such as organizational readiness, cost constraints, regulatory support, and stakeholder collaboration. However, most existing studies are either focused on developed economies or examine GSCM adoption at an industry-wide level, with limited attention given to in-depth analysis at the organizational level within developing countries like Malaysia.

This gap is especially critical given the heightened urgency for sustainable development in the aftermath of COVID-19, which has disrupted supply chains and amplified environmental concerns. As a result, there is a pressing need for research that investigates the specific challenges and drivers influencing GSCM implementation in Malaysia's construction sector to inform more effective policy and industry responses.

Green Supply Chain Management (GSCM) is referring as the incorporation of environmental consideration into supply chain management thru both upstream and downstream activities, comprises of product design, material acquisition, production, logistic, and end-of-life management (Feng, Lai & Zhu, 2022; Zhu et al., 2011; Badi & Murtagh, 2019; Shipeng, 2011). This methodology guarantees diminished waste, optimized resource utilization, and a lowered carbon footprint by evaluating environmental effects at each phase. Successful green construction initiatives necessitate coordination among stakeholders to implement sustainable practices from design up to end-of-life management (Badi & Murtagh, 2019).

Organizations implement GSCM strategies to reduce the ecological impact of their activities, acknowledging that sustainable practices are crucial at all phases of the production and supply chain (Balasubramanian & Shukla, 2017; Rostamzadeh et al., 2015). This methodology is essential, as environmental effects may arise at any stage of the production process (Badi & Murtagh, 2019).

According to previous research, GSCM techniques in the construction sector can be classified as green design, procurement, transportation, construction, and management of end of life (Debnath et. Al, 2023; Badi & Murtagh, 2019; Balasubramanian & Shukla, 2017). Additional classifications encompass green procurement, awareness of the environment, conservation of energy and water, and encouragement of sustainable practices (Ali et al., 2019). Green design encompasses strategies for reducing the environmental impacts of a service or product across its entire lifecycle (Debnath et. Al, 2023; Rostamzadeh et al., 2015).

The implementation of Green Supply Chain Management (GSCM) practices in the construction industry has been a subject of increasing interest all over the world. This could be attributed to a wider recognition of the environmental impacts that are associated with construction activities, as well as the potential for GSCM to mitigate these impacts. An examination of research from a variety of nations illustrates not only the global reach of GSCM techniques but also the specific problems and opportunities that are found in many locations, including Malaysia.

According to The UAE Sustainability Report 2023, as of Q3 2023, the average occupancy rate of LEED-certified assets was 95.9%, up from 85.1% in Q3 2022. Compared to the previous year, the occupancy rate of non-LEED-certified developments increased to 89.5% during this time. LEED-certified properties have consistently outperformed non-LEED-certified properties in terms of rental prices, partly because of the increased demand but also because of the superior quality of these properties.

The adoption of GSCM practices in developing countries has significant challenges, such as the high costs of sustainable products, inadequate awareness, and limited governmental incentives (Debnath et. Al, 2023; Badi & Murtagh, 2019; Balasubramanian & Shukla, 2017; Pinto & Allui, 2016). Nevertheless, opportunities exist, including potential cost reductions through resource efficiency, improved brand recognition, and compliance with international standards (Hoang and Jones, 2012). Studies by Ojo et al. (2014) and Mathiyazhagan et al. (2013) highlight the imperative for improved regulatory frameworks and stakeholder collaboration to tackle these issues.

Despite the geographical and economic differences among countries, the global trend indicates a growing acknowledgment of the importance of integrating environmental considerations into supply chain management in the construction industry. This convergence suggests a promising future for GSCM practices worldwide, albeit one that requires overcoming significant barriers, particularly in emerging economies like Malaysia.

The transition from conventional Supply Chain Management (SCM) to Green Supply Chain Management (GSCM) in the construction sector marks an important step towards embracing sustainability and responsibility for environmental concepts. This transition marks a departure from conventional practices, underlining the construction sector's growing commitment to reducing its ecological footprint and addressing the urgent need for sustainable development.

Barriers to Adopting GSCM

Various studies have explored internal and external barriers to adopting Green Supply Chain Management across different industries—such as manufacturing and logistics—highlighting challenges like high implementation costs, lack of expertise, and regulatory constraints, yet there remains a need for further investigation within underrepresented sectors, particularly the construction industry. Internal barriers are obstacles that arise within the organization and depend on the management's decisions. External barriers are the obstacles originating from the outside of the organization that may require collaboration with external stakeholders to surmount (Debnath et. Al, 2023; Badi & Murtagh, 2019; De Sousa Jabbour, 2015)

Internal Barriers

The substantial implementation cost. For every stakeholder, additional expenses related to using green practices create major difficulties. It was also considered in the research of the application of green practices in the building sector and other sectors (Debnath et. Al, 2023; Badi & Murtagh, 2019; Cao and Zhang, 2011). According to Debnath et al (2023), the high cost of GSCM implementation and its processes, which include product design, material sourcing and selection, production, delivery to end-users, and post-consumer recycling which serve as obstacles that deter organizations from adopting GSCM. Debnath et. al (2023) and Abbasi & Nilsson (2012) added that the challenge of balancing the reduction of environmental impact with the increasing financial cost associated with the organizations' activities.

Insufficient Knowledge and Awareness. Previous research on green construction methods shows that insufficient information and awareness of using green practices and their advantages constitute a major obstacle that prevents the organization from implementing these practices (Wibowo, Handayani, & Mustikasari, 2018; Sourani & Sohail, 2011; Cao and Zhang, 2011). According to Badi & Murtagh (2019), insufficient research on the indoor air quality of environmentally friendly constructions could be the reason for insufficient awareness. The lack of knowledge in understanding the successful implementation of GSCM makes it challenging to engage with the unknown becomes challenging and complex (Balasubramanian, 2012). Ojo et al. (2014) mentioned that insufficient knowledge and expertise as the primary obstacles to GSCM implementation in the Nigerian construction industry and emphasized the necessity for awareness and outreach initiatives for all respective stakeholders in the construction industry.

Lack of Top Management Support: Wibowo, Handayani & Mustikasari (2018) and Balasubramanian (2012) noted that the absence of senior management commitment to engage GSCM is a significant impediment, given its substantial driving power and the capacity to enforce compliance. Alongside its obligations to promote and empower people, enhance their involvement, and bolster devotion, this can be accomplished through employee motivation, training, and retraining, and effective communication across all organizational levels.

Lack of Resources: Technical barriers such as scarcity of eco-friendly construction materials, insufficient technical expertise, as well as shortages of skilled workers, significantly hinder the effective implementation of the sustainable construction principles (Balasubramanian, 2012; Enshassi & Mayer, 2005). In addition, the initial investment required for green techniques is costly as well (Luthra et. al, 2016).

External Barriers

Shortage of Green Suppliers: Organizations use green resources offered by suppliers to execute green initiatives. Organizations struggle to implement green practices in their supply chain when the materials are inaccessible through a standardized supply and delivery network. Partnership with suppliers who offer delivery guarantees, flexible payment terms, and fair costs is predicted to boost green practices according to (Shi et al, 2013).

Government Regulation and Support: The government can function as either driver as well as barrier as government is responsible for developing environmental regulations for construction industry and if regulations are absent, companies will not be obliged to engage in green practices, just as are lacking government support system remains the most prevailing barrier to GSCM practices in construction firms (Balasubramanian, 2012; Elbarkouky, & Abdelazeem, 2013). Another researcher, Sheu and Chen (2012), suggested that while governments play an important role in boosting GSCM adoption, the lack of proactive measures such as tax breaks or green subsidies can hinder progress. Feng, Lai & Zhu (2022) added that the importance of successful government engagement in creating environmental regulations and encouraging cross-industry collaboration to support GSCM.

Lack of Public Awareness: Many stakeholders and consumers are not aware of the benefits of sustainable construction practices for the environment, which limits the pressure of the markets on the organizations to adopt GSCM. It is difficult for organizations to justify the higher costs associated with practices due to a lack of awareness, as demand for environmentally friendly construction still remains low (according to Amade et al., 2020; UJContent, 2022).

Additionally, Dubey et al. (2015) stated that the associated organization will be required to implement GSCM due to the pressure from stakeholders in the supply chain, particularly when those involved in the supply chain are their upstream stakeholders, who are ultimately responsible for paying for their service and product. It is clear from the previous statement how the upstream stakeholder has a greater degree of impact on determining the adoption of GSCM for the entire supply chain system. This occurrence becomes even more important when the developer demands that all downstream stakeholders adhere to environmentally friendly practices in order to make sure that their building is acknowledged as a green building, thereby attracting prospective clients who are concerned about environmental issues. Nevertheless, the effectiveness of GSCM will be determined by the openness of downstream stakeholders to work together and work with upstream parties (Balasubramanian, 2020).

The available literature provides valuable insights but tends to offer generic findings and broad solutions regarding the adoption of Green Supply Chain Management (GSCM), often lacking specificity when applied to particular industries such as construction. This study aims to investigate and provide a focused explanation of the internal and external barriers that hinder GSCM adoption, including organizational limitations, cost challenges, regulatory gaps, and stakeholder resistance. By identifying these influencing barriers, the study seeks to offer a broader understanding to enhance the adoption of green practices. The outcomes are expected to contribute both to the academic understanding of GSCM implementation and practical improvements within supply chain strategies, particularly in the context of the construction industry.

3. Research Methodology

This study utilizes a qualitative methodology, which is suitable for acquiring an understanding of their point of view of stakeholders involved in GSCM in Malaysia. Qualitative research facilitates a comprehensive understanding of stakeholders' relationships and the other particular issues they face. This approach is selected for its usefulness in research that needs the examination of complicated and diverse issues, such as the implementation of sustainable adoption in extremely dispersed as in the construction industry.

Semi-structured Interviews

Semi-structured interviews were conducted with industry players, encompassing government officers, contractors, and consultants who are involved in the industry. The interviews are important in obtaining firsthand information and knowledge from pivotal stakeholders involved in the construction industry, whereas document research will facilitate the mapping of policies, reports, as well as industry standards. In previous research, Ahmed et al. (2020) have quoted those qualitative methods, such as interviews and document analysis, yield comprehensive insights into the barriers and drivers of GSCM implementation.

Purposive sampling was utilized in choosing individuals who are engaged in the construction industry. This approach assures that the data obtained originated from stakeholders processing important information and perspectives. The sample consisted of:

- Project Managers, Technical Managers, and Project Engineers are integral to the daily operations and decision-making processes concerning project execution, particularly in the implementation of sustainable practices (Darko et al., 2017).
- Technical and Contract Managers: These individuals offer strategic oversight and are accountable for assuring adherence to governmental legislation and business policy concerning sustainability (Lam et al., 2019).
- Government Officials Specializing in Construction Research and Development: Their participation will yield insights into the regulatory environment, governmental initiatives, and policies that advocate for GSCM in the construction sector (Hoang & Jones, 2022).

Semi-structured interviews were performed with industry stakeholders, including government officials, contractors, and consultants engaged in the sector. This method provides flexibility in questions while ensuring that fundamental enquiries are consistently addressed in each session. The enquiries focused on stakeholders' experiences with GSCM, their views on governmental actions, the roles of different stakeholders, and the internal and external obstacles they face in implementing GSCM. The principal criterion for selecting an individual for participation is their capacity to represent stakeholder groups within the Malaysian construction sector.

The interview guide included open-ended questions aimed at examining several facets of GSCM, such as:

"Have there been any governmental initiatives to support GSCM in our construction?" In what manner?
“What regulations and policies exist to encourage sustainable construction practices in Malaysia?“
“What are the internal and external barriers to the adoption of Green Supply Chain Management in the Malaysian construction industry?”

Interviews were conducted in person or over the phone, depending on the participants' preferences and availability. Each interview lasted approximately 30 minutes and was recorded with participants' consent to ensure accuracy in data collection. The semi-structured format enabled the researcher to explore in-depth the experiences, attitudes, and strategies of construction professionals regarding GSCM adoption (Rubin & Rubin, 2012). A unique code was assigned to each of the respondents to ensure the individuals and organizations remain anonymous during this study, and this was agreed upon when conducting each of the interviews.

The chosen participants must possess the necessary knowledge and qualifications to represent the specific stakeholder group (Costello & Osborne, 2005; Patton, 2002; Miles & Huberman, 1994). This aimed to guarantee that respondents could assist with tackling the research topics (Gubrium et al. 2012).

Below was the brief profile of respondents involved in this study (Refer to Table 1).

Table 1: List of Research Participants

Code	Level	Department	Stakeholder Category
R#1	Executive	Instrument & Control	Client
R#2	Executive	QAQC & Project Planning	Contractor
R#3	General Manager	Operation	Contractor
R#4	Executive	Contract	Contractor
R#5	Executive	Occupational Health & Safety, Environmental	Client
R#6	Senior Executive	Contract	Contractor
R#7	Executive	QAQC	Client
R#8	Senior Manager	Project Management	Contractor
R#9	Senior Executive	Occupational Health & Safety, Environmental	Consultant
R#10	Director	Technical and Project Management	Contractor
R#11	Director	Project Management, Contract & Commercial	Contractor
R#12	Senior Executive	CREAM CIDB	Government Officer

This study encompasses several stakeholder groups; hence, the analysis concentrated on each group's viewpoint regarding the general landscape of GSCM in the construction industry. The data collected from each stakeholder group was aggregated and analyzed collectively, then arranged by the emergent themes. Twelve interviews were conducted, and all interview files were transcribed using the TurboScibe.ai software.

The data obtained from the interviews underwent thematic analysis, following Braun and Clarke's (2023) six-phase approach: (1) familiarization with the data, (2) generation of initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming themes, and (6) producing the report. A total of 25 initial codes were generated during the coding process. These were then grouped and refined through multiple rounds of analysis, resulting in 12 preliminary themes. After further consolidation and validation, 8 final themes were identified, which formed the basis for interpreting the findings (Refer to Table 2).

The data obtained from the interviews undergo thematic analysis, a technique employed to find, categorize, and present patterns or themes within qualitative data.

Table 2: Derivation of Themes and Codes

CATEGORY	THEMES	CODES
Internal Barriers	Cost Constraints	Cost constraints for the initial cost High cost
	Lack of Awareness	Awareness level GSCM adoption is new to industry players
	Lack of Education and Training	Lack of knowledge & expertise Training & skills development
	Operational Stage	Challenges in operations Department/unit approval and endorsement
External Barriers	Limited Availability of Green Material	Limited availability and few suppliers Price of green materials Limited resources Selection of sustainable material Commitment
	Lack of Coordination	Fragmented supply chain Bureaucracy and red tape
	Limited Market Demand	Acceptance and perception of the client

	Location
	No proper monitoring & standards
	Not many industry players are interested.
	Regulatory & policy barrier
Lack of Government Support and Engagement	Regulatory & policy gap
	Lack of incentive from the government
	Lack of push factor between industry & government
	Inconsistent in environmental regulation
	Lack of knowledge and understanding

The interview was performed with representatives of stakeholder groups in the Malaysian construction sector to gather extensive qualitative data for this research. The data obtained from the interviews provides basic insight into their perspectives on internal and external hurdles to GSCM adoption.

4. Results

This section captures findings on numerous internal and external constraints that influence the implementation of GSCM techniques within the construction sector, as well as strategies for overcoming these challenges from the perspective of the research participants.

Internal Barriers

The study identified financial constraints as an internal barrier to the implementation of Green Supply Chain Management (GSCM). Participants indicated that the **initial costs** of green materials and technologies associated with sustainable practices exceed those of conventional alternatives, leading many contractors to opt for traditional, less expensive materials instead of adopting innovative technologies. R#2, R#3, and R#4, all from the Contractor group, in tandem, stated that constrained financial resources may hinder organizations' capacity to invest in green technologies.

Another response pertained to the technology introduced by the government, known as the Industrial Building System (IBS), echoed by participant R#7. From the perspective of the Client group, he stated that *"Construction costs are higher than conventional systems due to components being manufactured in the factory."* All this feedback pertained to the costs incurred by the organization.

The second internal barrier pointed out is a **lack of awareness** among industry participants. Feedback suggests that the adoption of GSCM is still developing, and inadequate efforts have been undertaken to encourage and improve understanding of its advantages and methodologies.

"The GSCM adoption is new to Industry Player. Not enough awareness and promotion.". R#3

Moreover, there exists resistance to change, as numerous stakeholders favour conventional techniques over sustainable alternatives, hence limiting the extensive implementation of Green Supply Chain Management (GSCM). R#11 stated that *"Key challenges include lack of awareness, resistance to traditional practices, and high capital costs for sustainable materials and technologies."* Another participant, R#9 (Consultant Group) highlighted that "*One barrier of the GSCM adoption in the construction industry is market demand for green buildings remains comparatively low due to a lack of awareness and prioritize the cost saving over sustainability*," which constrains the motivation for developers to invest in GSCM unless pressured by clients or regulatory authorities.

In addition to the internal barrier, three participants shared the same point of view about the **lack of knowledge and expertise** among industry participants as a substantial internal barrier. The most recent adoption of GSCM has resulted in inadequate promotion and awareness, prompting resistance to transition from conventional methods. A shortage of experts in GSCM contributes to the ineffective transfer of knowledge to the sector, hence impeding the advancement of GSCM processes.

Based on participant feedback, one of the barriers to implementing in the Malaysian construction industry is

the **operational disruption** caused by introducing green practices. It was shared by one of the participants, R#11. He added that:

"… introducing green practices may cause disruptions to the company's existing workflows and operations. To adjust to new systems may reduce efficiency in the short term, which can create internal resistance from management and workers concerned with meeting deadlines or maintaining profitability".

Additionally, almost all participants from the Client and Contractor groups suggested that the incompatibility of existing technology used with green materials or sustainability-focused methods may also cause technical hurdles, which are unfavourable to the companies to invest in a new system."

Table 3 below represents a summary of the internal barriers to GSCM implementation.

Table 3: Summary of Internal Barriers

Internal Barriers	Description
High Initial Costs	The adoption of green materials and technologies is hindered by their higher costs compared to conventional alternatives. Furthermore, investment is further impeded by inadequate financial resources.
Lack of Awareness and Promotion	Inadequate propagation and awareness of the advantages and methodologies of GSCM. The demand for green buildings is minimal, as stakeholders prefer conventional practices due to cost concerns.
Shortage of Knowledge and Expertise	The industry's capacity to comprehend and implement sustainable practices is restricted by a dearth of GSCM experts, which leads to ineffective knowledge transmission.
Operational Disruptions	The efficiency of extant workflows may be reduced by green practices, which may disrupt them. Technical obstacles are also generated by the incompatibility of current technologies with sustainable methods.

External Barriers

Participants identified problems concerning **the accessibility of sustainable resources and market demand**. A participant, R#3 (Contractor Group), stated that "*the accessibility of local green materials remains constrained, necessitating reliance on imported products by many companies, thereby elevating costs.*" Another participant from the same group, R#11, added that:

"The government is only implementing heavy taxes for importing materials, but the equivalent ***material is not available locally.*** *For example, the government recently implemented the Anti-dumping tax (20-30%) for some materials, such as stainless-steel steel, but Malaysia did not produce the same material! How would the construction companies take the initiative in implementing GSCM?"*

All participants from the Contractor group shared that a **lack of coordination** due to a fragmented supply chain could be one of the external barriers that hinder GSCM implementation in the construction industry. This is clearly stated by R#8:

"It's hard to implement green business practices successfully because small, medium, and large businesses fail to cooperate. This makes it tougher for people to work together and agree on environmental goals, which makes it harder to implement GSCM throughout the supply chain."

Limited market demand due to not fully understanding the benefits of GSCM, shared by one of the participants. R#12, representing the Government Officer group, claimed that limited market demands due to a lack of awareness and prioritizing cost saving over sustainability, causing low market demand to invest in green practices. His view is also shared by another participant (R#9) noted, *"Not many industry players are interested in adopting green practices."*

Participants highlighted that **regulations and policies could prevent** the adoption of sustainable practices. *"Inconsistent or stringent regulations regarding environmental standards could hinder the progress of emphasizing GSCM in the construction industry,"* noted one participant (R#1). While R#5 representing the Client group quoted that *"No strict laws enforcing the sustainable requirements in every construction project".* He reiterated that this is one of the main reasons why green initiatives are taking more time to catch on. Similarly, R#3 brought out the regulatory and policy gap, which also creates uncertainty that may prevent the implementation of GSCM.

Further feedback also suggested that while some of the suppliers in Malaysia are shifting to eco-friendly and greener products to improve their Environmental Sustainability and Governance (ESG) performance, the **lack of incentives from the government** has left the industry with low motivation. One participant. R#7 quoted that:

"… the lack of regulatory standards, punitive measures, or effective incentives limits the widespread adoption".

Participants also expressed worry about the lack of 'push factors' from the government as well as the industry, which also resulted in a low level of GSCM adoption. Another participant, R#3, agreed and stated that *"inconsistency in environmental regulations and practices can create confusion, and it prevents consistent GSCM practices in the Malaysian construction industry."* Table 4 below represents a summary of the external barriers to GSCM implementation.

Table 4: Summary of External Barriers

External Barriers	Description
Accessibility of Sustainable Resources	Reliance on expensive imported products is further restricted by tariffs, such as the Anti-dumping tax on stainless steel, due to the limited availability of local green materials.
Lack of Coordination	The absence of coordination and cooperation among small, medium, and large businesses complicates the implementation of GSCM throughout the entire supply chain.
Limited Market Demand	A lack of awareness and a tendency for cost-savings over sustainability are the primary factors contributing to the low demand for sustainable practices, which in turn diminishes interest in green practices.
Regulatory and Policy Challenges	The construction industry's adoption of GSCM is impeded by a lack of strict enforcement and inconsistent or stringent regulations, which create uncertainty.
Lack of Government Incentives	The motivation of companies to adopt eco-friendly materials and green practices is restricted by the absence of effective government incentives, standards, and punitive measures.

Discussion

From the study, researchers found that there were several barriers that affect the implication of GSCM adoption in the Malaysian construction industry and which can be categorized into internal and external barriers. Those barriers have been proven by authors in their previous research.

Internal Barriers

Initial Cost of Green Materials and Technologies

Any additional expenses related to green practices may create major difficulties. The issue of high initial cost has always been the issue of green practices adoption (Hoang & Jones, 2022; Wibowo, Handayani & Mustikasari, 2018; Lindermann et al., 2012). To adopt environmentally friendly practices within the organization, it makes sense to acquire new machinery and equipment. Hence, it requires several training courses before the usage of new machinery and equipment, where all the new training may cover respective employees within the organization to embrace and understand the concepts, procedures, and challenges of GSCM before commencing the practice. The financial burden on the organization will certainly increase the cost of training and the time that has been spent on the training.

According to Sandanayake (2022) and Baumers et al. (2016), the cost of new machinery and equipment will be influenced by their productivity, as a decline in productivity will decrease the organization's profit. This led to increased operation costs for an organization that are beyond the reach of the majority of small and medium-sized companies, which generate only just enough revenue to remain in the industry.

Lack of Awareness Among Industry Participants

From this study, participants' common feedback about GSCM adoption was a lack of awareness among industry participants. Balasubramanian (2012) quoted that a lack of knowledge in understanding the success of GSCM adoption makes it difficult to engage with the unknown becomes complex and challenging. These study findings also support the study conducted by Wong, Wah & Wong (2023). Insufficient information and awareness regarding the benefits of green practices can hinder the organization's adoption of this practice, as mentioned by previous studies (Wibowo, Handayani & Mustikasari, 2018; Sourani & Sohail, 2011).

This finding is also supported by Debnath et. al (2023) and Shurrab et al. (2019), which GSCM will be intensified by the organization's lack of knowledge and experience in green practices, as they are unsure of the steps necessary to be considered environmentally friendly or how to initiate green practices. In addition, people who are unaware of the existence of green practices when their level of knowledge is low which results in the organization's incompetence in the green practices area. Similarly to Gu et al. (2023) and Hoang & Jones (2022), this will maintain the traditional approach to the construction industry, preventing the development of innovation, breakthroughs, or quantum leaps that would enable the industry to achieve a more sustainable future.

Lack of Knowledge and Expertise

Currently, Malaysia is deficient in green professionals who can oversee and facilitate the implementation of green practices in the construction industry. However, the government has tried to train more professionals by conducting MyCrest and GBI through CIDB. Low awareness of green practices among construction industry stakeholders will result from a lack of collaboration and cooperation in the adoption of green practices. This is due to the reduced number of green professionals as highlighted by Wong, Wah & Wong (2023). Additionally, the organization will be obstructed from adopting green practices due to the difficulty in locating available green expertise, as they are unable to initiate the process without the advice of a professional or consultant. Ultimately, this will hinder the advancement of the green trend in the Malaysian construction industry. (CIDB HQ; Green Building Index; Law Partnership)

Operational Disruption

Based on the study findings, the participants believe that implementing GSCM in existing practice may cause operational disturbance. This is due to the difficulty in sourcing supplies and balancing costs. This is in line with previous studies such as Charef, Morel, and Rakhshan (2021) and Mojumder & Singh (2021). Traditional vendors who do not satisfy green standards may cause delays and budgetary pressure, potentially bleeding the procurement process. As a result, incorporating these new practices necessitates collaboration across all project stages, which may increase complexity, as stated by Mubarik et al. (2023). The selection of the correct partners was a substantial disruption to the operation because of the endeavor to align with the green requirement as one of the factors for partner selection. Reshaping the supply chain network may generate additional uncertainty at the operational level, requiring the business to navigate a new regulatory context (Hoang & Jones, 2022; Wu & Barnes, 2016).

Finally, delays are common because of integrating GSCM with the project's existing timeline. The complexity of the green supply chain, particularly the procurement and logistics of resources, always causes delays in project delivery. Furthermore, traditional construction enterprises may fight all these changes due to long-standing habits Khayyat, Balfaqih, Balfaqih, & Ismail, 2024; Agyekum-Mensah and Knight, 2017).

External Barriers

Lack of Incentives from the Government

The government plays a crucial role in ensuring the success of GSCM adoption in the construction industry. Participants in this study shared their perspectives on Malaysian government incentives or programs to encourage more green activities. Previous studies (Zaman, Ali, & Khan, 2024; Govindan et al., 2014) cited a lack

of government incentives as one of the challenges to GSCM deployment. The point was that, while some businesses are prepared to invest in sustainability, the financial burden that they confront, particularly small and medium-sized businesses, might be overwhelming, especially without government backing. This may explain why most businesses favor traditional methods, which are less expensive in the short term but detrimental to the environment (Govindan et al., 2014; Eltayeb et al., 2011).

Studies conducted by Hoang & Jones (2022) and Laari et al. (2018) found that a relationship between government and industry players, as well as government policies, is required to ensure successful GSCM adoption. Larger organizations may have greater resources and are more likely to pursue green initiatives, whereas small businesses are frequently left behind due to a lack of financial incentives and government assistance. Many businesses were unwilling to prioritize green efforts over more immediate financial concerns due to an unclear structure or government assistance.

Lack of Coordination Among Players

Lack of coordination among multiple players in the construction sector could hinder the adoption of GSCM, where good communication, clarity of role, and better integration of GSCM are critical in determining the successful implementation of GSCM, and it was supported by a few researchers.

Xin (2024) and Shi et al. (2013) used the example of the Chinese construction sector, where the absence of clear roles and communication channels between diverse participants, such as suppliers and contractors, made it difficult to effectively execute green procurement. This difficulty arose because of unfamiliarity with green procedures and technology, which caused all relevant parties to work at cross purposes.

Another researcher, Govindan et al. (2014), made a similar point, stating that a lack of communication among contractors, planners, and designers can lead to inefficiencies. The requirement for clear communication and integrated strategies makes it challenging to align all stakeholders who share the same aims, which are to achieve green objectives, particularly during the green design and procurement process. Misalignment may also result in project delays and cost increases over the intended budget. Similarly, implementing GSCM may disrupt traditional supply chains, particularly logistics and procurement, where the interaction between contractors and subcontractors is already complex. Delays and risks to satisfying environmental standards may arise if a clear and effective communication channel is not established (Cahyadi et. al, 2023; Mubarik et al., 2023).

Accessibility of Sustainable Resources (Shortage of Green Supplies)

From the participants' point of view, they agreed that the scarcity of green products in our market may serve as one of the external barriers that difficult for their organization to use sustainable resources. Ahmed et al. (2020) quoted that the availability of green materials in the construction industry itself acts as a barrier to GSCM adoption. In the construction industry, there exists a restricted range of products that fulfill environmental standards (Balasubramanian, 2020). This finding supports the previous studies (Shi et al., 2013), where partnership with suppliers who offer delivery, fair costs, and flexible payment terms may boost green practices.

According to Balasubramanian (2020), in the absence of suppliers of green products and materials, potential practitioners will be reluctant to engage in green commerce because obtaining the necessary materials and services will be more difficult and expensive, which will eventually lower the building's quality.

Moreover, according to Mubarik et al. (2023) and Shi et al. (2013), a construction stakeholder finds it difficult to decide whether to work with an existing supplier who does not offer green technology in their services and goods or look for a new supplier who does. This is because there are a lot of unknowns with new suppliers, which makes practitioners hesitant to select one over the other. However, this problem may be readily resolved, and green practices will become standard procedure in the construction sector if an increasing number of suppliers offer green technology in their services and goods.

Limited Market Demand (Lack of Public Awareness)

Awareness about the benefits of sustainable construction practices for the environment among stakeholders

and consumers may limit the pressure of the market demand in the adoption of GSCM in organizations. Organizations have difficulty justifying the increased expenses related to environmentally friendly construction techniques due to a lack of awareness, as the demand for such construction remains low (Amade, 2020; UJContent, 2022).

It is important for an organization to take this factor into account, as the demands of customers in their end products and services influence the upstream stakeholders. In the present day, consumers have begun to express concern regarding environmental issues and are optimistic that they can contribute to the green aspects through their capacity (Badi & Murtagh, 2019). Therefore, they will refrain from selecting products and services that are not environmentally favorable and will favor organizations that incorporate green concepts into their operations, production, and provision. To draw in these potential customers, the organization must adopt green practices, such as GSCM, to enhance customer satisfaction. This will ultimately end up in customers selecting the organization and achieving a higher profit in their final year of operation (Balasubramian, 2020).

Regulatory and Policy Enforcement (Lack of Regulation and Support)

From the study, among all external barriers, most participants agreed that without regulatory and policy enforcement, the adoption of sustainable practices. It matched with previous studies (Ahmed, Sayed, Asran, & Nosier, 2023; Balasubramanian, 2012; Elbarkouky & Abdelazeem, 2013) where companies will not be obliged to engage in green practices if there is are lack of government support in terms of regulation enforcement. Mubarik et al. (2023) and Khidir et al (2009) also supported that institutional support for the principles of environmental management is limited. It is supported by Hsu et al. (2013), where the implementation of governmental legislation regarding sustainable practices will make certain that a large number of organizations adhere to and meet the minimum standards established by the authorities. Furthermore, there are not enough governmental initiatives concerning legislation and regulation related to environmental practices, as mentioned by Debnath et al. (2023) and Mathiyazhagan et al. (2013).

For example, in Malaysia construction industry CIDB regulates construction projects, and they function to oversee, direct, and evaluate the construction activities on site. CIDB regulates construction companies, construction projects, and activities in Malaysia. Companies that fail to comply with the minimal requirements will face penalties, including fines, work stop orders until the issues are resolved, and the inability to renew their company's construction license, known as *Sijil Perakuan Pendaftaran Kontraktor (SPK).* In order to mitigate these issues, the majority of construction companies choose to fulfill the requirements, including adherence to the environmental standards for materials and technologies established by the government (Hoang & Jones, 2022**;** Shi et al., 2013).

5. Managerial Implications and Recommendations

This study only provides a baseline understanding of GSCM adoption in the Malaysian Construction Industry. The results and conclusions of this study may offer guidance and opportunity for further research in the subsequent areas:

- Although researchers have identified external and internal barriers faced by various stakeholders in adopting and achieving GSCM in the construction industry, further studies can be initiated to investigate factors that are crucial to the successful implementation of GSCM.
- An additional study using a quantitative survey that involves more participants from various stakeholders can be carried out for future studies to obtain more information on their views in regards to GSCM adoption.

Conclusion

This study enhances the comprehension of various barriers, internal and external, that might hinder the successful adoption of green supply chain management in Malaysia, specifically in the context of the construction industry. The study identifies four internal barriers that organizations encounter: operational disruption, lack of awareness, lack of knowledge and expertise, and high initial costs. Conversely, the investigation identified five external obstacles: inadequate coordination, inadequate market demand, regulatory and policy obstacles, and inadequate government incentives.

In general, the results of this study make a valuable addition to the existing information about the current adoption of green supply chain management from the various stakeholder perspectives and are anticipated to be beneficial to our initiative to implement GSCM in the Malaysian construction industry.

This study holds significant importance as it has the potential to make substantial contributions to both the sustainability objectives of the construction sector and the academic field of supply chain management. Moreover, it plays a crucial role in promoting innovation, aiding Malaysia in achieving its long-term environmental goals, and providing a competitive edge for industry participants.

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