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Doctoral Thesis

Strategic Sourcing In the Construction Industry

Submitted by:

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In Partial fulfillment of the Requirements for the Degree of Doctor of Business Administration (DBA) in Supply Chain Management

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Date:

10 June 2025

DECLARATION

I hereby declare that the work in this thesis entitled, "Strategic Sourcing In the Construction Industry" has been undertaken and completed by me for the award of the degree of **Doctor of Business Administration in Supply Chain Management** with European International University, under the guidance of Prof. (Dr.) S. Edmund Christopher.

I also declare that this thesis is an original work and has not been submitted for any degree or diploma in any other university or institution. Further, I declare that the texts, figures, tables, and any other material taken from other sources has been acknowledge, referred and cited in the best of my knowledge and understanding



Signature of Research Scholar,
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CERTIFICATE OF ORIGINALITY

This is to certify that the thesis entitled "Strategic Sourcing In the Construction Industry" is a Bonafide research work conducted by Krishnadas Ramachandran in partial fulfilment of the requirements for the award of the **Doctor of Business Administration in Supply Chain Management** degree from the European International University (EIU-Paris). This research was carried out under my supervision and guidance.

The thesis represents an original work undertaken in accordance with the academic regulation of the European International University. This content of this thesis reflects the independent research efforts of the candidate. This thesis has not been submitted for the award of any degree, diploma, or other qualification at any other university



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Date: June 2025

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UNIVERSITY APPROVAL

This dissertation titled, “Strategic Sourcing In the Construction Industry” has been examined and approved by the European International University (EIU-Paris) for the award of the **Doctor of Business Administration in Supply Chain Management.**

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Abstract

This study explores the impact of strategic sourcing practices on procurement success in the construction industry, with a specific focus on green sourcing, supplier relationship management, advanced technologies, and risk management practices. Using regression analysis, the research investigates how the adoption of these practices influences procurement outcomes, such as cost efficiency, time management, and supplier performance. The findings indicate that green sourcing, the use of advanced technologies like AI and block chain, effective supplier relationship management, and comprehensive risk management strategies all contribute significantly to procurement success in construction projects. The study suggests that adopting these strategies can lead to improved supplier reliability, enhanced material availability, and reduced supply chain disruptions, ultimately resulting in more successful procurement processes. This research provides both theoretical and practical insights into how the construction industry can leverage strategic sourcing to improve procurement outcomes. The study highlights the growing importance of sustainable procurement practices and technological integration, while also addressing the challenges and barriers faced by companies in implementing these strategies. Furthermore, the research offers recommendations for future research and managerial strategies to further enhance procurement practices in construction projects. This study contributes to the growing body of literature on procurement and sourcing practices in the construction industry and provides valuable insights for both scholars and practitioners.

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CHAPTER 01 -INTRODUCTION

1.1 Background of the Study

It has come to play a significant role in operational performance in the construction sector in relation to individual project delivery, cost control and the general competitiveness of construction companies utilizing strategic sourcing. With the ongoing development of the construction industry on the global level, the industry experiences a row of problems such as dynamic prices of raw material, limited supply of skilled labor, and more and more demanding project needs. Strategic sourcing here is the procurement behaviors where there is a conscious and systematic process in selecting suppliers, materials, and services to facilitate a construction project. The importance of strategic sourcing is seen in the phenomenon that it aligns strategic goals of construction companies with the procurement ones, providing efficiency, quality, and schedule (Singh et al., 2024).

The increasing demand of sustainability and green building are considered as one of the most outstanding drivers of the necessity of strategic sourcing in the construction industry. Such trends compel companies towards the use of more sustainable materials and processes and this further heaps pressure on sourcing strategies. In addition, the increased complexity in construction projects that involves multiple stakeholders and different sub-contractors further increases the need to have the sophisticated procurement plans (Ghosh, Mandal, & Ray, 2021). Consequently, the construction industry has resorted to strategic sourcing as a means of controlling costs of procurement as well as means of enhancing strategic capability of working in the challenges of a dynamic and competitive market.

The increasing prominence of strategic sourcing in the construction industry is also conditioned by technological changes in procurement practices such as the emergence of digital procurement platform, data analytics tools, and supply chain solution tools. The technologies help to make better decisions and allow construction companies to track the performance of suppliers, evaluate risks and opportunities to decrease costs. Nevertheless, strategic sourcing in construction is not exactly a piece of cake. The supply chain challenges, geopolitical risks, and the problem of coordination between several suppliers on large-scale projects have come to the forefront in recent years, especially after the global impact of such events like the COVID-19 pandemic (Qian, 2022). Subsequently, construction companies have to cope with the dynamically changing ideal situation in procurement, in which risk management and the necessity of efficiency and cost control operates together.

The availability of strategic sourcing is part of the capacity of the construction industry to cope with the needs of contemporary projects. It extends further than the conventional concept of procurement, in which materials and services are bought at the lowest possible cost. Rather, it is a more detailed process by which the impact of long-term supplier relationships, quality control, supply chain risks and the conformed role

of materials, concerning the support of sustainability goals of the project, are taken into account. Through targeting the strategic fit between the sourcing practices and the organizational objectives, construction companies can obtain better performance, cost reduction, and even improved outcomes of the projects performed (Sivasubramaniam et al., 2024).

One of the most significant characteristics of strategic sourcing concerning the construction industry is that it reduces the risk of supply chain compromission. The construction sector strongly relies on the availability of goods and services in a timely manner. Delays in supply of key resources would also affect heavily on project schedules leading to cost escalation and reduced satisfaction of the clients. To limit such a disruption, strategic sourcing refers to the process of developing viable networks of suppliers and establishing sustainable ties with trusted vendors. It also makes it possible to allow the system to allow suppliers to be reviewed and chosen by the firms based on diverse grounds, such as superior financial stability, production capacity, and their ability to enact strict regulatory measures.

In spite of these benefits, strategic sourcing in the construction industry is one of the allied fields that fall under various challenges that are likely to undermine its performance. Lack of skilled labor is the major issue, and being fueled by internationalization of education, migration patterns, among other factors (Agure & Elafi, 2024). This shortage of skilled labor impairs the capability of a firm to implement any project in an efficient manner and makes it more dependent on external suppliers of skilled labor. Such deficiency of the expertise also influences the quality of the job, which influences the supplier selection process and the overall procurement strategy. The lack of available labor limits construction firms and the necessity to make strategic sourcing decisions when dealing with human workers and subcontractors gains more significance.

Variation in material prices is another issue, which may considerably influence cost structure of construction project. Sourcing also prevents these fluctuations through building relationships with suppliers and negotiating good terms with them. Nevertheless, during economic uncertainty or in case of the interruption of the supply chains, even the effectively negotiated agreement might not help to control the costs (Sivasubramaniam et al., 2024). Besides, sourcing strategies may be further complicated by the global events like natural disasters or geopolitical tensions that restrict access to the material of key importance or derail established supply chains.

The effects of strategic sourcing on a construction project cost and delivery are immense. The cost of construction is usually one of the greatest determinants of the success or failure of a project. Strategic sourcing therefore fulfills a central role of containing procurement expenses, expenditure control, and achievement of projects staying within the budget. Through material cost-reduction, supplier value-propositions, and purchasing purposeful timing, building companies can streamline their expenditures and prevent profitless cost escalations (Zondi & Saira, 2023).

Moreover, strategic sourcing helps in better project delivery by making the materials and the services be on-demand rather than wait to be fully supplied. With a big construction work, several contractors and suppliers have to synchronize their work to facilitate work continuity. Efficient strategic sourcing makes project schedules to be met and company project managers obtain materials and services needed to meet project schedules. Delay in procuring materials particularly those that are critical in nature can lead to a snowball effect of delays thus leading to overall project delays. Strategic sourcing is effective in that choosing suppliers based on how they deliver goods on time, and how they scaled up with the requirements of the project prevents complications of executing the project.

The process of strategic sourcing is typically broken down into several key steps:

- **Spend Analysis:** The first step is to analyze all past and current spending to understand where money is going. This involves gathering data on purchases by category, supplier, and project. The goal is to identify opportunities for consolidation, cost savings, and process improvements. For instance, a company might discover it's buying the same material from multiple vendors at different prices.
- **Supplier Market Research:** This involves looking outward to understand the broader supply market. It includes researching potential new suppliers, benchmarking pricing, and studying market trends and risks. This step helps a company find the best possible vendors and prepare for negotiations.
- **Sourcing Strategy Development:** Based on the spend analysis and market research, a company develops a strategy. This involves defining clear criteria for selecting suppliers, which go beyond price to include factors like quality, delivery reliability, financial stability, and sustainability. Suppliers are often segmented by importance to focus strategic efforts on high-value, high-risk items like structural steel or specialized equipment.
- **Supplier Selection and Negotiation:** This stage involves formalizing the process through requests for proposals (RFPs) and then negotiating with potential partners. The focus is on a win-win scenario, aiming for multi-year agreements with clear performance metrics (Key Performance Indicators or KPIs) rather than one-off, transactional deals.
- **Relationship Management and Performance Monitoring:** The work doesn't stop after a contract is signed. Effective strategic sourcing requires continuous management of supplier relationships. This includes regular performance reviews, open communication, and tracking performance against agreed-upon KPIs to ensure ongoing value and continuous improvement.

The growth in the use of technology in construction industry also has an impact on development of strategic sourcing. Artificial intelligence (AI) and machine learning (ML) are utilized to enhance sourcing decisions,

to streamline the procurement process and to enhance supply chain visibility as well as with the aid of digital procurement platforms. These technologies give constructing companies the possibility to gather and process the data about the supplier's performance, plan the possible outages in their supply chains and evaluate the risk potential of suppliers and materials (Singh et al., 2024).

An example is that the system installed in AI can forecast any possible changes in the prices of the materials utilized using past records and market patterns. This enables the procurement teams to make sound decisions regarding when to buy materials and under what price. This can also be the case with more sophisticated supply chain management programs that will show current inventory levels, delivery schedules and supplier performance to help with making decisions that are more transparent and eliminating possible hold ups. Technology integration to the strategic sourcing practices is, therefore, aiding construction firms to increase competitive advantage alongside project outcomes.

Key Applications in Procurement

- **Predictive Analytics and Demand Forecasting**: AI and ML models analyze historical project data, market trends, and even weather forecasts to predict the demand for materials. This helps procurement teams to order the right quantity of materials at the right time, preventing both costly over-ordering and project delays due to shortages. This also assists in finding the optimal time to purchase materials to lock in the best prices.
- **Automated Supplier Selection and Vetting**: AI can streamline the process of finding and qualifying suppliers. Machine learning algorithms can quickly sift through vast amounts of data—including past performance, financial stability, certifications, and delivery times—to recommend the most suitable vendors. This ensures that firms are collaborating with reliable and high-quality suppliers, reducing risk.
- **Contract and Bid Management**: AI-powered systems can automatically generate and review contract documents, flag potential risks or non-compliance issues, and track key deadlines. During the bidding process, AI can analyze incoming bids against a predefined set of criteria, such as cost, quality, and compliance, to help procurement teams evaluate them more efficiently and objectively.
- **Risk Management**: AI continuously monitors external factors—such as geopolitical events, market fluctuations, and supplier performance—to identify and mitigate potential supply chain disruptions before they occur. It can provide early warnings of a supplier's financial distress or potential material shortages, allowing teams to proactively develop contingency plans.
- **Streamlining Routine Tasks**: AI can automate many administrative tasks in procurement, such as generating purchase orders, processing invoices, and matching them with receipts. This reduces human error, frees up procurement professionals from repetitive tasks, and allows them to focus on more strategic activities like negotiation and supplier relationship management

1.2 Problem Statement

Construction industry has its own peculiar issues of dealing with the intrigues of strategic sourcing in the contemporary market. Because of the fast-changing requirements of the construction job, and the considered demand on sustainability, it is causing a dramatic change in sourcing. Nonetheless, even with the increased focus on strategic sourcing, a considerable number of construction firms currently encounter the problems of ineffective procurement-related activities, ineffective supply chain management and the possibility of incorporating the concepts of green and sustainable sourcing. These challenges are exacerbated by the industry's reliance on traditional, soloed procurement methods, which often fail to meet the needs of an increasingly globalized and environmentally conscious marketplace (Ghosh, Mandal, & Ray, 2022).

In the ever-changing world where the construction industry is taking up new tech, like block chain and AI, sourcing in a more sophisticated and dynamic way becomes an urgent necessity. The emerging technologies pose distinct risks and opportunities to the supply chain introducing both challenges and efficiency. As an example, block chain technology provides more security and clarity in transactions but at the same time throws in the challenges of integration, and scalability (Ebekozien, Aigbavboa, & Samsurijan, 2023). The inability of the industry to deliver on these changes can be depicted as a loophole in the standards of strategic sourcing that otherwise can utilize these advancements to streamline the procurement efforts and scale up performance in the supply chain.

One of the key challenges in construction industry is the lack of integrated strategic sourcing model that can fit sustainable practices. Although the concept of green supply chain management (GSCM) is becoming popular in other industries, construction sector has not yet fully embraced this concept on a large scale. Green sourcing models have received specific importance to the construction industry where the green effect of material and construction process can be pronounced (Hussain, 2024). In the absence of a proper structure of incorporating sustainability in sourcing decisions, construction companies have not altered their behaviors of focusing on cost-effective efficiency rather than sustainability as a whole. This gap in the adoption of green sourcing practices limits the industry's ability to meet regulatory requirements and environmental goals, ultimately affecting the industry's reputation and long-term viability.

In addition, the influence of human relations on material acquisition and purchase decisions cannot be overestimated. Collaborative relationships with suppliers, contractors, and other stakeholders are important in ensuring that projects in the process of construction are carried out within the budgets, on time and to the desirable standards. However, a very strong disconnect with the human relationship management and the strategic sourcing at many construction firms still exists. Such negligence in the area of interpersonal relations frequently creates ineffective material acquisition processes, which slow down the processes, increase costs, and inefficiency in the supply chain (Hasim et al., 2023). The construction firms should

understand that factors that lead to the success of strategic sourcing are not only systems and processes but also the associated relations built and sustained along the supply chain.

The growing sophistication of the supply chain in construction projects is also an aspect that has to be factored in strategic sourcing especially in an event that involves a number of suppliers, contractors, and sub-contractors who operate on various geographical locations. Global supply chain is a challenging component of sourcing since it offers risks of distractions and delays in the logistics required of managing the chain (Pai & Hungund, 2025). The challenges have been increased further by the increase in the cost of materials and the demand by the construction companies, which has made the close coordination between suppliers and construction companies to be even more imperative. These complexities involve sophisticated inventory management and risk assessment as a way of avoiding the challenges that affect the successful delivery of construction projects.

One of the key barriers to improving strategic sourcing in construction is the industry's traditional procurement model, which often lacks flexibility and innovation. A range of construction companies continues to use obsolete procurement procedures that do not consider employing modern technologies and approaches (Stephen et al., 2025). Such traditional practices do not fit appropriately to meet the challenges of the modern construction environment, which is becoming more competitive, highly regulated, and concentrated on a more sustainable construction market. The industry's resistance to adopting innovative sourcing strategies and technologies like AI and block chain further contributes to inefficiencies and missed opportunities in procurement and supply chain management.

Against the backdrop of these issues, the construction industry is in dire need of a restructured strategic sourcing model that should take into account the positive effects of technological development as well as sustainable activities. By adopting this type of model, the firms can not only resolve the acute problems of cost, efficiency and sustainability, but also create resilience and adaptability within their procurement systems. Moreover, there would be a more complimentary sourcing strategy that would work with the international norms and policies, and such coordination within the supply chain would be more effective that cannot easily lead to risks and negative consequences on the outcomes of the entire project. The industry's failure to develop and implement such a model presents a significant research gap and an opportunity for academic exploration.

It is not a secret that there is the increased demand to use sustainable approaches to construction practices, which, in their turn is accompanied by issues emerging technologies raise, explaining why there is the urgent need to adopt new procurement framework reflecting needs of the industry more accurately. With construction companies intensifying their efforts toward attaining sustainability objectives and keeping up with technology, strategic sourcing would truly play a more decisive role in the sustained success of the industry. Lack of risk management, proper management of human relationships, and the delay in the

implementation of new sources of the model jeopardizes the potential of change in the construction industry (Stephen et al., 2025). In this research, it is the aim of the researcher to close such gaps by creating a more sustainable, adaptable, and comprehensive strategic sourcing approach to the construction industry. Through the following issues, the study shall help in enhancing the procurement practices, cost, environmental responsibility, and enhanced supplier relationships in the construction industry.

1.3 Purpose of the Research

The purpose of this study is to investigate the current state of strategic sourcing in the construction industry, focusing on procurement practices, supply chain optimization, and the integration of sustainable sourcing strategies. The research aims to explore the challenges and opportunities associated with strategic sourcing in construction projects, particularly in the context of increasing demand for sustainability and cost efficiency. This study will examine how strategic sourcing impacts project performance, delivery timelines, and overall competitiveness in the construction industry. It will also analyze the effectiveness of existing procurement models and identify areas for improvement, especially in the adoption of green and sustainable practices. The research will further explore the role of emerging technologies, such as block chain and AI, in optimizing sourcing strategies and supply chain management, with a particular focus on the challenges faced by small and medium-sized enterprises (SMEs) in implementing these technologies.

1.4 Research Objectives

The primary objective of this research is to explore and analyze the strategies employed in strategic sourcing within the construction industry. Specifically, the study aims to:

- To identify and categorize the primary strategic sourcing practices employed in the construction industry, with a focus on sustainability.
- To assess the challenges faced by construction firms in integrating sustainable and green sourcing practices into their procurement strategies.
- To evaluate the role of emerging technologies such as block chain, AI, and supply chain optimization tools in improving the efficiency and effectiveness of strategic sourcing.
- To analyze the impact of strategic sourcing on project performance, including cost reduction, delivery timelines, and quality of construction.
- To examine the impact of local versus global sourcing strategies in construction material procurement, focusing on the benefits and drawbacks of each approach (Ajiboye et al., 2024).

1.5 Research Questions

In line with the above objectives, the following research questions have been formulated:

- What are the key strategic sourcing practices employed in the construction industry, and how do they influence project outcomes?
- How do sustainability and green supply chain management practices integrate into the strategic sourcing strategies of construction firms?
- What challenges do construction firms face in implementing sustainable sourcing practices, and how can they overcome these challenges?
- How do emerging technologies, such as block chain and AI, affect the strategic sourcing and supply chain optimization in construction projects?
- What is the relationship between strategic sourcing practices and project performance in terms of cost, time, and quality?
- How do local and global sourcing strategies for construction materials affect project outcomes, particularly in terms of cost and delivery timelines?

1.6 Research Gap

There are quite a number of research gaps regarding the construction industry, especially in terms of strategic sourcing in the industry, as the construction industry practice tends to have a highly complex nature. Whereas there is a lot of literature regarding the general principles of supply chain management, strategic sourcing in construction is still understudied, particularly its effects on project performance, cost, and sustainability. Current literature tends to concentrate on particular elements of sourcing, like cost management or supplier performance, and does not focus on integration of these practices in the context of construction projects that is unique (Cherian, Munuswamy, & Jasim, 2021). Currently, literature is not tightly joined and there is no coherent notion of the impact of strategic sourcing on different phases in the construction project, such as procurement and project completion.

Moreover, even though strategic sourcing practices in construction are discussed at length, especially, concerning post-COVID-19 changes and stakeholder demands, there is a lack of studies on the long-term sustainability of the strategies (Sahu, M, & Rao, 2023). The changes that have occurred in the construction industry so radically due to the pandemic show the necessity of cost-effective but also sustainable materials and options that can be obtained through sourcing strategies. However, empirical evidence of how strategic sourcing can be utilized in fulfilling these emerging needs and simultaneously, reduce threats in terms of supplier performances, quality assurance, and project delays is unavailable (Sahu, M, & Rao, 2023).

In addition, there are emerging technologies, namely artificial intelligence, block chain, and digital procurement platforms, that have found an application in other industries but have not been thoroughly examined from the perspective of incorporation into the strategic sourcing models inn construction. Such technologies provide an optimistic perspective of enhancing efficiency, transparency, and security of the

construction procurement process, yet the potential application of such technological advances and its ability to be effectively implemented as a source decision in the construction projects is lacking understanding (Zerihun & Wondemalem, 2022). One of the most significant drawbacks that need to be addressed in this research is that there is no comprehensive framework considering how these technologies should be used in terms of strategic sourcing.

Moreover, the research lacks a great deal in the study of the role of geopolitical and socio-economic forces on strategic sourcing in the construction sector, particularly in developing economies. Most literature on strategic sourcing tends to concentrate on either the Western countries or the developed economies but little is known about the dynamics in emerging markets such as Ethiopia, Afghanistan and others. Such areas are especially poor at transferal due to variables associated with the sourcing such as unstable supply processes, fluctuating costs and inaccessible skilled labor which current models are sometimes unable to capture (Sharifzada & Deming, 2024). Comparative analysis into the sourcing strategies being used in these various regions can be of help to indicate how the construction industry can adjust to the different environmental conditions.

The other research gap is the concept of how strategic sourcing and organizational performance relate with each other in the context of the construction industry. Although sourcing decision-making is believed to have direct implications on cost management and project delivery, it tends to have larger effects on the performance of an organization, in general, especially when it comes to competitiveness and long-term sustainability (Zerihun & Wondemalem, 2022). It requires more delicacy where more strategic sourcing practices are associated with associated more general company results, including more revenue, market share and customer contentment. The lack of knowledge and understanding in this perspective shows why strategic integrated sourcing is needed that extends beyond transactional approach to procurement to sourcing that understands the long-term strategic alignment to a business.

1.7 Study scope

This study is going to be into the establishment of a complete strategic sourcing system in the construction sector that includes conventional procurement tactics as well as seamless incorporation of innovation technologies. It will be conducted to evaluate the implications of sourcing decisions on project results in cost, time, and quality, and especially on sustainability and supplier performance (Sahu, M, & Rao, 2023). The study will also investigate how construction companies can utilize the digital technologies that could transform construction procurement process and allow managing better supplier relationships: AI and block chain.

The issues of construction companies in the developing nations, specifically the challenges connected with the geopolitical and socio-economic aspects that determine the sourcing choices, will also be within the

scope of this work (Sharifzada & Deming, 2024). Comparative studies of sourcing in developed and developing nations will help in gaining useful information that will help the industry to fit in various environmental settings. It will involve an analysis of the ways that organizations in such territories as Ethiopia, Afghanistan, and India use strategic sourcing to address their logistic issues, minimize costs, and enhance the timeframe of project delivery (Cherian, Munuswamy, & Jasim, 2021).

The study will involve a careful analysis of the procurement practices of various institutions, giving attention to the local and global sourcing varieties and how they can influence the performance of the projects under consideration (Ajiboye et al., 2024). The research will use the mixed methods research design where the qualitative component entails interviews with the industry professionals, and the quantitative data analysis will be used to determine the utility of different sourcing models. It is expected that the areas of interest will comprise supplier performance, the implementation of green sourcing practices, and the importance of strategic sourcing in optimizing the performance of the projects.

The study will also address the new reality of the situation after the COVID-19 pandemics, when the pressure on construction companies is growing to meet the needs among various stakeholders, with supplier performance aligning with expectations (Sahu, M, & Rao, 2023). This research paper will assist construction companies enhance their sourcing strategies and long term competitiveness by giving them practical recommendation in the area of enhancement of their sourcing strategies to make them more resilient and sustainable. The results will be of use to both small and large construction companies and especially to the SMEs in order to enable them to incorporate best practices in both strategic sourcing and supply chain management.

1.8 Study significance

This research is important because it could contribute to improving the knowledge of strategic sourcing processes in the construction industry and especially in the framework of sustainability and supply chain management. Given that construction projects continue to grow in complexity, the companies are going to need much more strategic and sustainable sourcing choices that reflect the overall trend of building greener across the world. The study also tries to address the gaps in current knowledge regarding the effects of sourcing decisions on the long-run success of construction projects in light of the growing demand of sustainable materials and the resilience of the supply chain (Bello et al., 2024). It is hoped that the application of green supply chain management (GSCM) in the context of strategic sourcing will help the study to provide great insight into how contracting companies can adopt environmental friendliness of their project plans to achieve a high level of efficiency and minimizing cost (Bello et al., 2024).

Theoretically speaking, the proposed study will contribute to the body of knowledge regarding the role of strategic sourcing in the construction industry. The study will present an integrated model of sourcing

strategy evaluation that combines the aspects of sustainability, technological developments/innovations, and risk-taking, giving a more comprehensive picture of how procurement can be streamlined to balance its efficiency and environmental friendliness (Alastal et al., 2025). The framework will address a severe gap; this is because it will deal with the encounters between sourcing practices and rising technologies like block chain and AI which promise to turn the procurement world on its head in the construction industry (Tran et al., 2024). Smooth implementation of innovative technologies such as block chain in construction sourcing will also be discussed in detail in the study, as it is an under-researched topic in the existing studies on the critical success factors (CSFs) of the view (Bello et al., 2024).

To construction companies, the practical value of this research is seen in the ways in which the research will contribute to better performance of strategic sourcing decisions. This study shall offer practical guidelines to the company on how firms can enhance their sourcing to fulfil stakeholder expectations, maximize the performance of suppliers and strengthen supply chain resilience (Bello et al., 2024). The research will inform the organization in the challenges of incorporating sustainability in the procurement process and avoid delays in the project and risks that may come with unpredictable costs and supply chains (Bello, Stephen, Adetoro, & Mogaji, 2024). Besides, the study will point out how new technologies like those that block chain can be implemented into construction sourcing to enhance transparency, security, and accountability during the procurement framework (Tran et al., 2024).

This will be useful to professionals and practitioners of construction supply chain management in the sense that it presents an exhaustive explanation on the most current trends and issues in strategic sourcing. The research will provide useful information on how to get the best of sourcing decisions to match the ever-changing environment of the current construction project by integrating both innovative technologies and traditional procurement models. It is also going to give the information on the best practice of balancing cost-efficiency and sustainability with new technologies available and how these can be used to improve procurement performance (Sahu, M, & Rao, 2023). As an example, block chain may allow the results of transactions with suppliers to be more transparent to facilitate reducing fraud and trust levels between partners (Tran et al., 2024). It will be especially helpful to professionals of the construction industry who undertake the effort to introduce more secure and robust sourcing processes within their companies.

Policymakers and regulators, the other targeted users of the study will also find the study useful because they are charged with the responsibility to develop system infrastructure that facilitates sustainable construction practices and integration of new technologies. With the construction sector staying up to speed with Industry 4.0 or even going further, there is an urgent need to have a new regulatory standard to foster innovation but consider future environmental responsibility and compliance (Bello et al., 2024). The study will assist in formulating regulatory decisions to facilitate sustainable sourcing, effective supply chain best procedures, and use of technologies like block chain, which would facilitate streamlining of procurement

and enhanced projects (Alastal et al., 2025). It will also provide solutions to absence of comprehensive and context sensitive guidelines to strategic sourcing in construction industry, particularly in emerging economies, where the procurement difficulties have existed further due to economic and infrastructural constraints.

To the decision-makers in construction companies, study depicts the strategic value of sourcing decisions in supporting operation resilience, cash savings, and overall project success. With construction companies becoming more and more digitally oriented, implementing a state-of-the art sourcing strategy combined with powerful tools such as AI and block chain may give them a startup advantage in the fast-paced industry. The study will highlight why decision-makers need to make the necessary investment in effective sourcing strategies that can support changing market situations and sustainability objectives (Cherian et al., 2021). The study will help industry leaders to become more competitive in the end and secure the sustainability of their supply chains by providing tangible suggestions on how to streamline sourcing processes as well as introduce the element of sustainability into the procurement.

1.9 Organization of the Dissertation

This dissertation is structured into five key chapters, each addressing a specific aspect of the research on strategic sourcing in the construction industry:

- **Chapter 01: Introduction**
  The introductory chapter provides an overview of the study, including the background, statement of the problem, research objectives, research questions, research gap, and significance of the study. It also outlines the scope of the study and explains how the research is organized.
- **Chapter 02: Literature Review**
  This chapter reviews the existing literature related to strategic sourcing in the construction industry. It includes key concepts, an overview of current sourcing practices, the integration of sustainability, and emerging technologies in the industry. The chapter also explores the challenges and risks involved in sourcing, focusing on the need for innovative frameworks in procurement practices and supply chain management.
- **Chapter 03: Research Methodology**
  Chapter 03 details the research philosophy, strategy, and approach employed in this study. It discusses the data collection tools, sampling techniques, participant descriptions, and data analysis methods used to gather insights on strategic sourcing practices in the construction industry. The chapter also covers ethical considerations in conducting the research.
- **Chapter 04: Results & Findings**
  This chapter presents the findings of the research, including a detailed analysis of the data

collected. It discusses the demographics of the respondents, the descriptive data, and the testing of hypotheses related to strategic sourcing practices. The chapter will include charts and tables to summarize key findings.

- **Chapter 05: Discussion & Recommendations**

  The final chapter interprets the results of the research, discussing their implications for both academic theory and industry practice. It provides recommendations for improving strategic sourcing practices in the construction industry, highlights the limitations of the study, and suggests directions for future research.

CHAPTER 02 – LITERATURE REVIEW & CONCEPTUAL FRAMEWORK

2.1. Key Concepts

2.1.1. Strategic sourcing

Table 1 strategic sourcing concepts

Author	Element	Definition
Cherian et al. (2021)	Conceptual Foundation	Strategic sourcing is a systematic approach to aligning procurement with organizational goals through structured supplier evaluation and long-term planning.
Mansoor et al. (2021)	Supply Chain Optimization	Focuses on optimizing procurement processes to reduce waste, improve efficiency, and gain a competitive edge in complex construction environments.
Sahu et al. (2023)	Post-COVID Sourcing Decisions	Emphasizes digital coordination, resilience planning, and responsiveness to stakeholder expectations post-pandemic.
Kok (2023)	Relational Contracting	Builds sourcing relationships on trust, mutual goals, and collaborative risk-sharing rather than rigid contracts.
Ofori et al. (2025)	Performance-Based Procurement	Procurement strategies that directly support cost efficiency, quality control, and timely project delivery.
Zerihun & Wondemalem (2022)	Organizational Integration	Strategic sourcing embedded within the organizational structure ensures continuity, accountability, and standardized supplier practices.

Strategic sourcing is proving to be the most critical role in the construction sector shifting the sourcing practice to no longer being a transaction-based activity but a proactive and value-based approach. Such a change is necessary within an industry where success of its projects is ensured by proper management of costs, delivery within schedule and known relationships with its suppliers. Based on definitions and conceptual points by global scholars, this section critically unravels the six key dimensions of strategic sourcing in the direct contribution to the implementation of sustainable and efficient construction projects.

According to Cherian et al. (2021), strategic sourcing is a formal, sustained process of procurement, which links in making purchases involve strategic goals of an organization. Such perception signifies the paradigm change in short-term and price-dependent procurement behaviors. Rather, it is about developing uniformity, visibility and value building throughout the supply chain.

In this regard strategic sourcing starts with an in-depth spend analysis- determining what is being purchased, who is selling and for how much. The following measures also include sorting the suppliers into respective categories according to their strategic value, risk analysis, and setting buyers criteria that can be extended to corporate goals in the form of sustainability or innovative strategies. In construction industry, this involves determining contractors and vendors not only offering good rate but also having good delivery results, following safety requirements and emphasis on quality. This alignment would mean the

procurement process will no longer be associated with a passive supporting role, but will be one that facilitates strategic project delivery.

Mansoor et al. (2021) develop this discussion by focusing on the topic of supply chain optimization with the aid of strategic sourcing. Complicated construction with various fragmentation requires organizing the flow of equipment, services, and materials as one of the key aspects to ensure productivity and quite scarce delays.

Their findings underscore why traditional procurement approaches tend to cause inefficiencies like over dependence on a single supplier, weak inventory management system, as well as, reactive decision-making. Strategic sourcing is striving to deal with these problems with the help of intertwining the processes of procurement and supply chain management theories. This covers acquiring digital solutions to real-time monitoring of suppliers, predicting demand, and auto-reordering. Effectively, companies will ensure less wastage of materials, less purchasing at high costs at the last minute, and enable a competitive advantage by allowing their operations to run more smoothly.

As an example, a big project in the infrastructural field can have many suppliers regionally. Strategic sourcing enables buildings companies to ease the processes of communication to vendors, maintain the required stock without any excesses and deliver the supplies in the right time- neither too early to attract storage costs nor too late to postpone construction.

The COVID-19 pandemic broke the supply chains in the world because the weak point in the model of just-in-time delivery and highly centralized sourcing patterns was revealed. The paper by Sahu et al. (2023) investigates how this disruption resulted in a strategic review of sourcing practices with the focus on the role of digital coordination, resilience planning, and flexibility.

Supplier diversification, whenever convenient, local sourcing, as well as the utilization of digital platforms allowing on-demand risk-analysis should be the core of sourcing strategies in their post-COVID plan. An example is that construction companies might start moving to multi-regional supply to check reliance when there is lockdown or prohibition of borders.

Furthermore, resilience planning is about creating capacity buffers with suppliers, putting in contingency contracts and laying down nodes of the chain. This enables companies to be flexible to any shocks without sacrificing either cost or quality. According to Sahu et al., strategic sourcing has helped the construction industry to achieve operational agility, which includes such preparedness.

Although traditional procurement tends to be more rigid in its contracting and adversarial in relations, Kok (2023) brings the idea of relational contracting into the notion of strategic sourcing. This model is established on trust, transparency, and common-grounded goals as opposed to legal compliance.

Relational contracting has a number of benefits in the construction industry since the projects take a long duration to complete and involve the coordination of various stakeholders. It promotes the idea of teamwork, lowers friction levels, and makes it easier to address issues in case they surface unforeseen. Instead of sticking to punitive measures on the scope of non-cooperation, such contracts tend to make both parties committed to peculiar objectives like quality assurance, prompt delivery, and stickiness to a budget.

As an example, relational sourcing in large-scale public infrastructure may entail initial contractor engagement, conjunctive risk estimation, and performance-yielding incentives. This creates a teamwork atmosphere, in which the suppliers are not mere vendors, but also strategic partners in the project delivering results.

According to Ofori et al. (2025), there is a need to ensure there is consistency between the procurement practices and measurable project performance indicators. The shift towards a performance-based procurement is a shift away to the traditional practice of identifying suppliers based on lowest bid and towards dwelling on their capacities to present outputs based on critical Key Performance Indicator (KPIs) such as cost efficiency, quality output, delivery schedules and client satisfaction.

This method depends largely on historical data and supplier scores cards where past measure of performance is an indicator of performance in the future. As an example, one supplier may consistently perform i.e. delivers at the correct time and has a low number of defects, and this supplier may therefore be given the preference even when their bid is only marginally cheaper than that of other suppliers.

The use of performance-based procurement makes specific sense in construction: the quality of materials, the stability of contractors as well as cross-timeline coordination directly determines the success of the project. They would be able to enhance performance, accountability, reduction of rework, and better results of clients through the integration of the performance metrics in sourcing decisions.

Finally, Zerihun & Wondemalem (2022) appeal to the importance of implementing strategic sourcing at the same level as other parts of the organization. Instead of viewing procurement as an isolation task, they encourage a company to integrate it in corporate governance, project management and strategic planning processes.

That is including procurement teams at the beginning of the design and budget work on the construction project. It also needs alignment of the sourcing decision with enterprise-wide objectives like sustainable enterprise, control environmental cost and risk management. Integrating consumers within the organization leads to continuity amongst the departments, better communications between the site managers and the buyers, and proactive role of the procurement professionals in running the project planning.

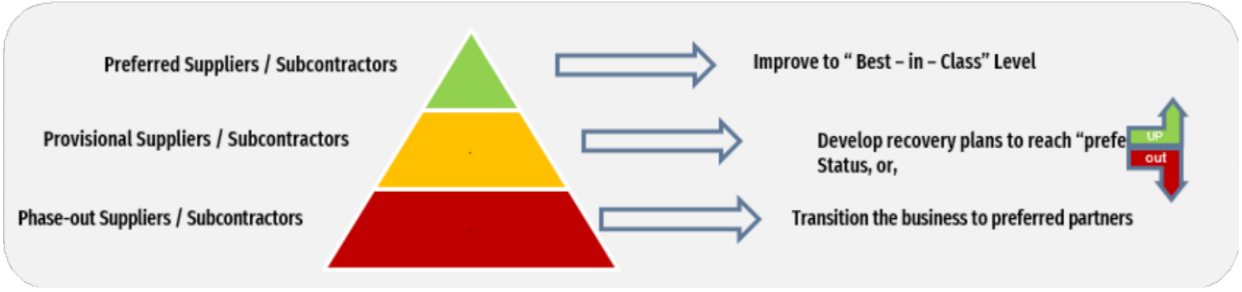
In addition, uniformity in procurement across the business units leads to an efficient process and eliminates variance in supplier assessment. The study by Zerihun & Wondemalem has revealed that companies that implemented such an approach had seen better performance in the organization, shorter procurement cycle, and better relations with suppliers.

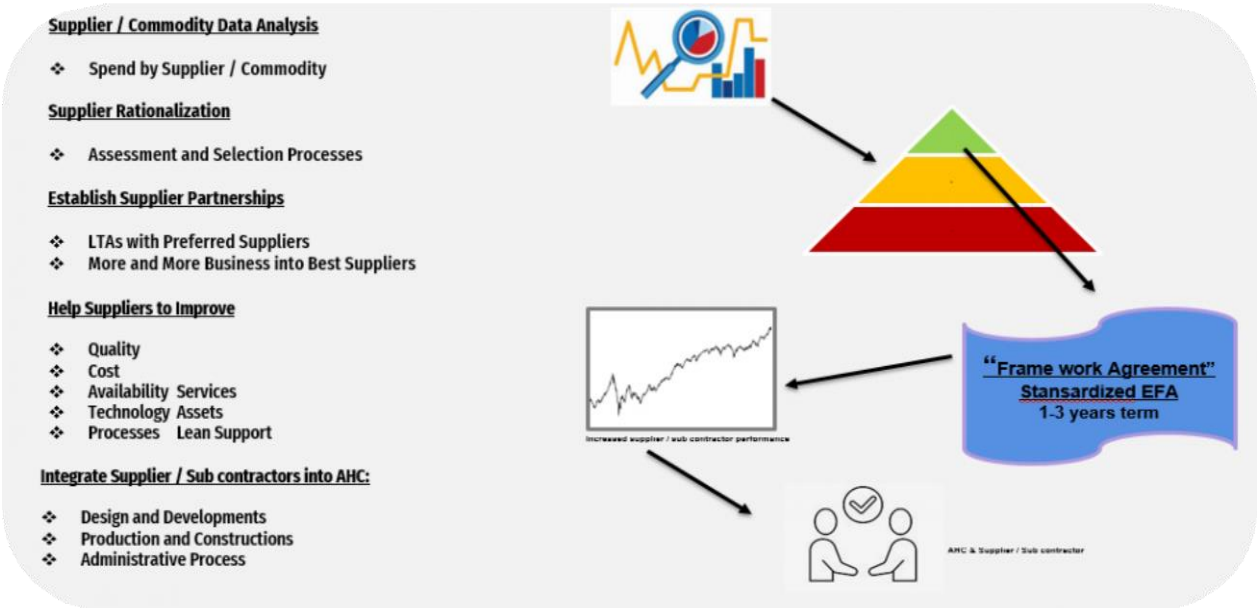
Traditional Procurement Vs Strategic sourcing

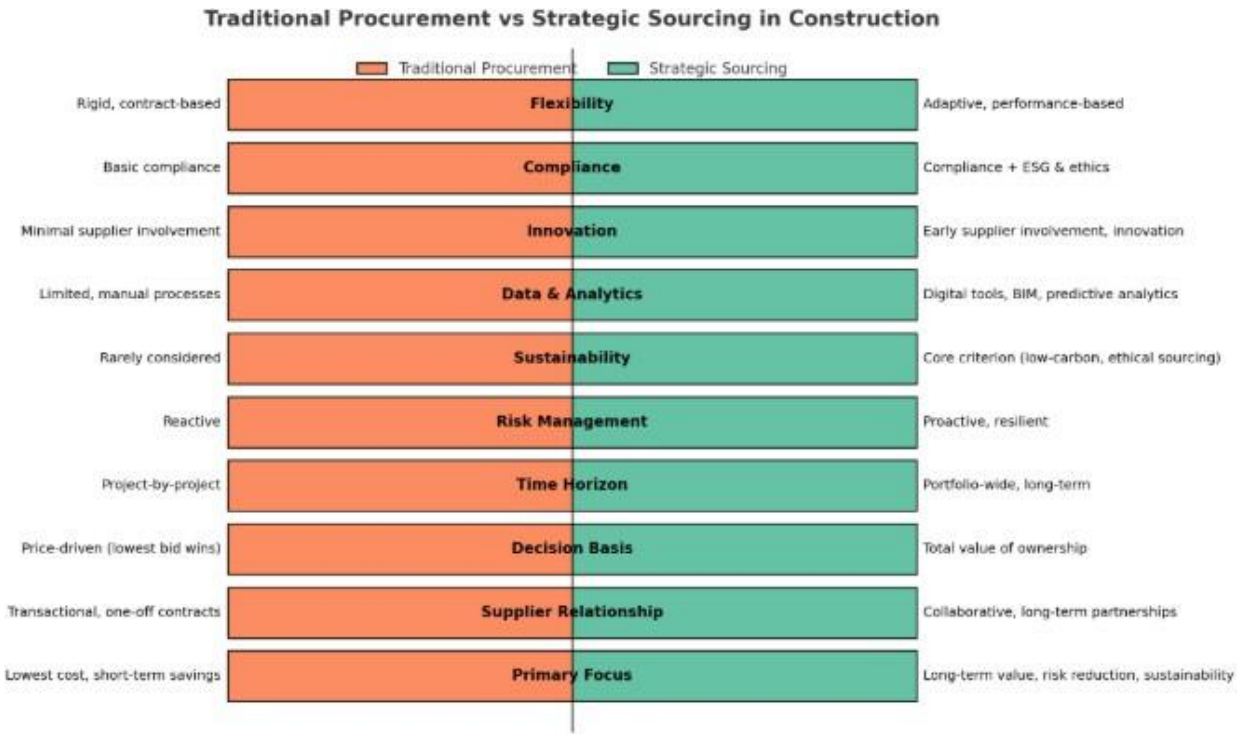


Traditional Supplier / Sub contractor Selection Approach

By adopting strategic sourcing, construction companies can enhance collaboration, drive innovation, and achieve better project outcomes.







2.1.2. Sustainability in procurement

Table 2 definitions of sustainability procurement

Element	Description	Key References
Green Sourcing	Prioritizing suppliers and materials that meet environmental and ethical standards.	Alastal et al. (2025)
Triple Bottom Line	Balancing economic, environmental, and social goals in procurement decisions.	Ajiboye et al. (2024)
Regulatory Frameworks	Compliance with LEED, ISO 14001, and national green construction codes.	Ajiboye et al. (2024), Alastal et al. (2025)
Multi-Criteria Decision-Making (MCDM)	Use of tools like AHP and TOPSIS to evaluate and select sustainable suppliers.	Alastal et al. (2025)

Barriers to Implementation	Includes high costs, lack of supplier transparency, and limited availability of green options.	Sahu et al. (2023), Ajiboye et al. (2024)
Benefits to Organizations	Improved brand image, regulatory compliance, stakeholder trust, and long-term value.	Cherian et al. (2021), Sahu et al. (2023)

In construction, sustainable procurement has emerged, as a strategic requirement as stakeholder, regulatory and environmental pressures on the industry have never been greater. The concepts of the following sections help to describe the basic constructs, which influence stable procurement practices, based on the modern research and implementation into the industry.

Sustainable procurement starts with Green Sourcing. It concerns the ranking of suppliers, materials, and products based on the environmentally responsible and ethically demure standards. Alastal et al. (2025) describe green sourcing as the assessment of the effect of a supplier on the environment, their workforce, and material suppliers. In the case of construction companies, this may involve the selection of concrete with low emissions, recyclable materials or an ethical supplier who has a fair. Labor certification.

Backing this up is the Triple Bottom Line (TBL) model, which persuades companies to consider three fundamental goals in the procurement process: economic viability, environmental responsibility and social equity. This implies, as Ajiboye et al. (2024) explain, that, in addition to finding the most favorable price, procurement officers are required to make their purchases ecologically friendly and conducive to ethical job activities and social well-being in communities. Instead, in practice it might mean buying products on the local market to promote local economies, even at a little more cost to the budget.

In order to pursue sustainability procurement in a systematic manner, companies turn to Regulatory Frameworks. Adherence to international and national standards like LEED (Leadership in Energy and Environmental Design), ISO 14001 (environmental management systems) and national building codes make procurement decisions to be in line with the best practices. The frameworks allow the companies to avoid fines, increase their transparency and build confidence with regulatory bodies and consumers (Ajiboye et al., 2024; Alastal et al., 2025).

Due to the complexity of appraisal of many sustainability factors Multi-Criteria Decision-Making (MCDM) tools are commonly, applicable that include AHP (Analytic Hierarchy Process) and TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution). The tools allow procurement departments to evaluate and score the suppliers both on the quantitative (e.g., cost, emissions) and qualitative (e.g., ethics, innovation) aspects (Alastal et al., 2025). One advantage of MCDM is that one factor, like price, cannot predominate the process of decision-making as there will be a more balanced and transparent process.

Although there are such improvements, Barriers to Implementation are still quite serious. According to Sahu et al., (2023) and Ajiboye et al., (2024), the following issues are detected: the excessive prices of

sustainable materials, the absence of transparency among the suppliers, and the inability to find local eco-certified counterparts. There is also the issue of internal resistance/or non-availability of procurement personnel trained in sustainability assessment of many firms.

However, Organizational side has the high Benefits. Companies that use sustainable procurement tend to have a better brand image, a less stressful regulatory approval and greater confidence shown by clients, investors and the rest of the society. Sustainability-driven firms ensure better long-term value creation and stability in a competitive and environmentally conscious environment as Cherian et al. (2021) and Sahu et al. (2023) indicate.

1. Sourcing Sustainable and Recycled Materials

One of the most direct ways to implement green sourcing is by choosing materials with a lower environmental footprint.

- **Recycled Steel and Reclaimed Wood:** Instead of using newly produced steel, which has a high carbon footprint, a project might source steel from recycled scrap metal. Similarly, using reclaimed timber from old buildings or dismantled structures reduces the demand for newly harvested wood and avoids landfill waste.
- **Alternative Concrete and Masonry:** The production of cement, a key component of concrete, is a significant source of CO2 emissions. Green sourcing can involve using concrete with alternative binders like fly ash (a byproduct of coal combustion) or slag (a byproduct of steel production). Projects may also opt for sustainably sourced brick and stone.
- **Locally Sourced Materials:** Sourcing materials from local suppliers significantly reduces the carbon emissions associated with transportation. For example, a project building in a region with abundant local timber might prioritize that material over wood shipped from overseas. This also supports the local economy and reduces the risk of supply chain disruptions.

2. Prioritizing Eco-Friendly Suppliers and Practices

Green sourcing extends to the entire supply chain, not just the final product.

- **Supplier Certification:** Projects can choose to work with suppliers who have certifications like ISO 14001 for environmental management systems. This ensures the supplier's entire operation, from manufacturing to logistics, adheres to strict environmental standards.
- **Low-Emission Transportation:** A construction company may require its suppliers to use low-emission vehicles or optimize their delivery routes to minimize fuel consumption. This helps to reduce the project's overall carbon footprint.

- **Waste Reduction Policies:** Partnering with suppliers who have robust waste reduction and recycling programs for their packaging and materials is another key aspect of green sourcing. This helps to minimize the amount of construction waste that ends up in landfills.

3. Incorporating Green Technologies and Systems

Procurement for a green building also involves acquiring technologies that will make the final structure more sustainable throughout its operational life.

- **Energy-Efficient Systems:** This includes sourcing energy-efficient HVAC systems, LED lighting, and high-performance windows and doors that reduce the building's long-term energy consumption.
- **Renewable Energy Sources:** Green sourcing can involve the procurement of solar panels or wind turbines to generate clean energy on-site, significantly reducing the building's reliance on the electrical grid and its associated emissions.
- **Water Conservation Systems:** This can involve procuring low-flow fixtures, rainwater harvesting systems, and graywater recycling technology to minimize water usage in the finished building.

4. Life-Cycle Assessment (LCA) in Procurement

A sophisticated approach to green sourcing involves using a life-cycle assessment (LCA) framework. This method evaluates the environmental impact of a product from its "cradle to grave"—from the extraction of raw materials, through manufacturing, transportation, use, and final disposal or recycling. By using LCA data, procurement teams can make informed decisions and choose materials that have the lowest total environmental impact over the entire life of the project.

For example, while one material might have a higher upfront cost, its lower energy consumption during the building's use phase could make it a more sustainable and cost-effective choice in the long run.

2.1.3. Emerging Technologies in Sourcing

Table 3 concepts of emerging technologies

Element	Description	Key References
Blockchain Technology	Used for smart contracts, traceability, and fraud prevention in construction procurement.	Bello et al. (2024), Tohfa et al. (2025)
Artificial Intelligence (AI)	Supports supplier evaluation, demand forecasting, and risk analysis using predictive analytics.	Sahu et al. (2023), Stephen et al. (2025)
Supply Chain Optimization Tools	Includes real-time tracking systems, automated ordering, and logistics optimization tools.	Mansoor et al. (2021), Tran et al. (2024)
Digital Maturity Models	Measures a firm's readiness and capability to implement digital sourcing technologies effectively.	Tohfa et al. (2025), Tran et al. (2024)

Challenges to Adoption	Technical complexity, cost, skill gaps, and poor interoperability limit widespread implementation.	Tran et al. (2024), Bello et al. (2024)
Strategic Value	Increases sourcing efficiency, transparency, and responsiveness; enhances competitive advantage.	Sahu et al. (2023), Stephen et al. (2025)

Newer technologies are changing the implementation of procurement in the fields and the construction industry is not an exception. These new developments will assist companies to be more dynamic, versatile and informed in their sourcing operations. The collection of six concepts presented below can be regarded as the major trends in technologies that dominate strategic sourcing in the construction industry, as corroborated by recent scholarly studies.

The technology behind block chain, i.e. Block chain Technology, is gaining acceptance in terms of its ability to improve transparency and trust in procurements. Block chain has made it possible to deal with smart contracts in the construction sector: automated contracts to be executed once certain conditions are fulfilled. This will make the payments efficient, minimize the paperwork, and save on the arguments about the delivery schedule. It also offers material and supplier action end-to-end visibility, effectively reducing frauds. As revealed by Bello et al. (2024) and Tohfa et al. (2025), block chain has the potential to significantly enhance trust in the eyes of stakeholders through a verifiable and permanent audit of each transaction in the sourcing lifecycle.

Another game changer is the Artificial Intelligence (AI), which is especially relevant in supplier selection and demand forecasting. With the help of the analysis of historical procurement statistics, market trends, and risk indicators, AI allows recognizing what suppliers perform well and suggesting potential bottlenecks. Sahu et al. (2023) and Stephen et al. (2025) demonstrate the usefulness of AI-based tools in enabling the procurement teams to make informed real-time decisions whether through material needs forecasting in the various stages of a project, or the identification of supplier reliability based on pattern recognition. AI also helps in detecting any anomalies or unethical activity that might escape the eyes when it comes to manual systems.

Supply Chain Optimization Tools are online websites that enhance logistics, inventory management, and order placement. Real-time GPS tracking automated inventory alerts, logistics planning software are one of the tools that can be used to optimize delivery rout, and track what is moving in construction firms. According to Mansoor et al. (2021) and Tran et al. (2024), these systems reduce wastage, idle time, and delay in delivering important parts to the construction sites. The tools referred are especially useful when the projects are large and require the participation of multiple suppliers and subcontractors at various locations.

Organizations should evaluate their Digital Maturity Models in order to implement the usage of these technologies successfully. These models consider the preparedness of a firm to adapt and incorporate the

digital procurement tools. They take into consideration aspects like available infrastructure, IT potentiality, employee positions, and culture. According to Tohfa et al. (2025) and Tran et al. (2024), the most powerful tools can easily break under the pressure of internal resistance or find themselves incompatible with operations without a clear vision of digital maturity.

Nevertheless, we still have The Challenges to Adoption. Various factors hinder the use of information systems in many firms and are based on high cost of implementation, technical nature, unavailability of skilled personalities and lousy interoperability of systems. According to Tran et al. (2024) and Bello et al. (2024), the challenge of incorporating new technologies into the legacy system is particularly a challenge faced by small- to mid-sized construction companies.

Notwithstanding these obstacles, Strategic Value of emerging technologies, however, cannot be discredited. Sourcing efficiency, responsiveness to a changing market, competitive benefit all adjusted and amplified by digital tools, according to Sahu et al. and Stephen et al.(2023) and Stephen et al.(2025). Firms in the construction industry can exploit technology to offer a frictionless experience, as well as enhance transparency in operations and address project needs in an unpredictable world.

2.1.4 Construction Project Performance

Table 4 Construction Project Performance definition

Element	Description	Key References
Key Performance Indicators (KPIs)	Includes cost efficiency, delivery timelines, and construction quality as performance metrics.	Ofori et al. (2025), Zerihun & Wondemalem (2022)
Procurement-Performance Link	Strategic sourcing influences project success by aligning procurement with delivery and quality goals.	Cherian et al. (2021), Mansoor et al. (2021)
Risk Mitigation Strategies	Involves contingency planning, diversified sourcing, and early risk detection through procurement.	Stephen et al. (2025), Sahu et al. (2023)
Supplier Relationship Management	Ongoing engagement and evaluation of suppliers to ensure consistency and performance improvement.	Zerihun & Wondemalem (2022), Ofori et al. (2025)
Data-Driven Decision Making	Use of analytics and performance data to evaluate sourcing effectiveness and predict project bottlenecks.	Sahu et al. (2023), Stephen et al. (2025)
Post-COVID Resilience	Sourcing strategies restructured to handle disruptions, material shortages, and supply volatility post-pandemic.	Stephen et al. (2025), Sharifzada & Deming (2024)

The effectiveness of construction performance is highly dependent on the occurrence of strategic sourcing practices. Projects are increasingly becoming complex and thus, sourcing strategies must be incorporated into the project objective to ensure the most optimal cost, time, quality, and resilience outcomes. In the

same vein, the next six factors contain the direct influence of sourcing on the construction performance that are validated by recent research.

The most direct method of measuring the success of construction projects is by use of Key Performance Indicators (KPIs). These usually entail cost-effectiveness, timely deliverance, and workmanship of finished products. The research by Ofori et al. (2025) and Zerihun & Wondemalem (2022) states that KPIs create a feedback loop and the project teams can assess the impact of the procurement strategies on the operational outputs. As an example, any slowdown in the delivery of materials can easily be interpreted into missed milestones and increased expenditures, which underlines the importance of a good sourcing framework.

The Procurement-Performance Link places attention on how strategic sourcing choice affect eventual harvests in whole project. Cherian et al. (2021) and Mansoor et al. (2021) describe that procurement must inherently be coordinated with project planning processes to ascertain that quality delivery of suppliers is achieved in line with project programs, budget limits, as well as schedules. Strategic sourcing enables sourcing to fall in line with the overall business and project goals, thus, streamlining implementation and reducing reworking cycles.

Risk Mitigation Strategies in procurement have become more critical in today's volatile environment. According to Stephen et al. (2025), and Sahu et al. (2023), diversified sourcing strategy, risk assessment of the suppliers, contingency planning can all help the construction firms to anticipate and respond to disruptions. To illustrate, locating alternative sources of supply in materials with huge criticality or substituting local supply in the event of global supply shocks will limit the exposure. This is a way of making sourcing a hedge against risk.

Related to risk mitigation is Supplier Relationship management. Continuous interaction, assessment and effectiveness in working with the suppliers will ensure quality consistency and will minimize the chances of shut down in the supply lines. According to Zerihun & Wondemalem (2022) and Ofori et al. (2025), when suppliers have long-term partnerships with firms, the negotiation terms are likely to be improved, delivery dynamics are likely to be enhanced, and innovation can be shared between the two parties. Frequent performance review meetings and cycle of feedbacks are crucial to development of such strategic relationships.

Data-Driven Decision Making is also relied upon by modern procurement. Sahu et al. (2023) and Stephen et al. (2025) note an increasing application of analytics and dashboards to determine the performance of suppliers, the inefficiency of processes, and the prediction of possible delays. Real time data enables managers to move towards proactive decision making as opposed to reactive decision making, particularly in the construction sector that is high paced where delays, even slight ones, have subsequent impending effects.

Lastly, another critical issue that has become a feature of the procurement strategy is Post-COVID Resilience. The pandemic has revealed how vulnerable the global supply chains were, and so firms have reorganized sourcing strategies. Stephen et al. (2025) and Sharifzada & Deming (2024) record that many of the companies prioritize developing flexibility in contracts, expanding local sourcing, and keeping more reserves, in order to prevent shortages in a short term. Such modifications contribute to a state of continuity and guard projects schedules in unstable contexts.

2.1.5. Local vs. Global Sourcing

Table 5 Local vs. Global Sourcing

Element	Description	Key References
Cost and Availability Trade-offs	Global sourcing offers cost savings and wider selection; local sourcing offers faster fulfillment and fewer delays.	Ajiboye et al. (2024), Bello et al. (2024)
Supply Chain Resilience	Local sourcing is often more resilient during global disruptions, such as pandemics or political instability.	Stephen et al. (2025), Ajiboye et al. (2024)
Delivery Timelines and Lead Time	Local materials typically reduce transportation time and uncertainty; global sourcing may introduce delays.	Sharifzada & Deming (2024), Ofori et al. (2025)
Quality and Standardization	Global suppliers may offer standardized, high-quality materials; local sourcing may risk inconsistencies.	Bello et al. (2024), Ajiboye et al. (2024)
Hybrid Sourcing Strategies	Combining local and global sources can balance cost-efficiency with responsiveness and reliability.	Ajiboye et al. (2024), Stephen et al. (2025)
Contextual and Regional Factors	Geographical, economic, and infrastructural factors affect sourcing feasibility and preferences in each region.	Ajiboye et al. (2024), Stephen et al. (2025)

Sourcing strategy is central in defining cost, resilience, speed of delivery, and quality in the construction industry. The decision-making between local and global sourcing has several trade-offs to it and it is highly dependent on contextual variables. These are the six components of parameters, which define this decision-making process as the most significant aspects of the project pointing out how crucial they are in terms of efficiency and reliability.

The most pivotal sourcing decisions are Cost and Availability Trade-off. The global sourcing can also facilitate the greater availability of suppliers and materials at a low cost more often when buying in volume or specific equipment in construction. Nevertheless, Ajiboye et al. (2024) and Bello et al. (2024) observe that even though global options could be cheaper, they also imply longer lead times, currency risks, and various dependence on global logistics. Local sourcing, on the other hand, which may be more expensive, provides certainty and prompt delivery, so significant where time is of essence in construction activities.

In the aftermath of worldwide disruptions including the COVID-19, Supply Chain Resilience has gained greater significance. According to Stephen et al. (2025) and Ajiboye et al. (2024), local suppliers are easier to work with and more responsive in crises, which helps the firm to avoid the risks of port closure, shipping

delays, or geopolitical tension. When a construction company decentralizes sourcing and retains part of the procurement in the region, a construction company can be able to ensure continuity in despite the fact that the global channels will have been compromised.

Delivery Timelines and Lead Time are strictly connected with resilience. The time spent in transportation and the uncertainty of the customs, regulations and long-distance logistics is much shorter when local sourcing is used and applied. According to Sharifzada & Deming, 2024, and Ofori et al., 2025, global supply chain delays can be a very harmful element to the construction schedule. These risks can be done away with the use of local supplier particularly on the supply of the basic or bulk materials such as cement, gravel or bricks.

Another complication is brought about by Quality and Standardization. Suppliers in the global market, in most cases, offer quality products, including those working by international rules and certifications. Bello et al. (2024) and Ajiboye et al. (2024) however note that local suppliers may not all comply with quality standards given differences in technology or processes or regulatory supervision. This induces a paradox: How to reconcile the predictability of international sourcing and availability of home sources.

To deal with these complexities, a lot of companies turn into the implementation of Hybrid Sourcing Strategies. According to Ajiboye et al. (2024) and Stephen et al. (2025), integrating local and global sourcing allows companies to enjoy cost benefits of global sourcing opportunities and still have responsiveness due to local suppliers. As an example, a company could import expensive structural parts yet obtain the common building materials locally. This strategy favors agility and control of budget.

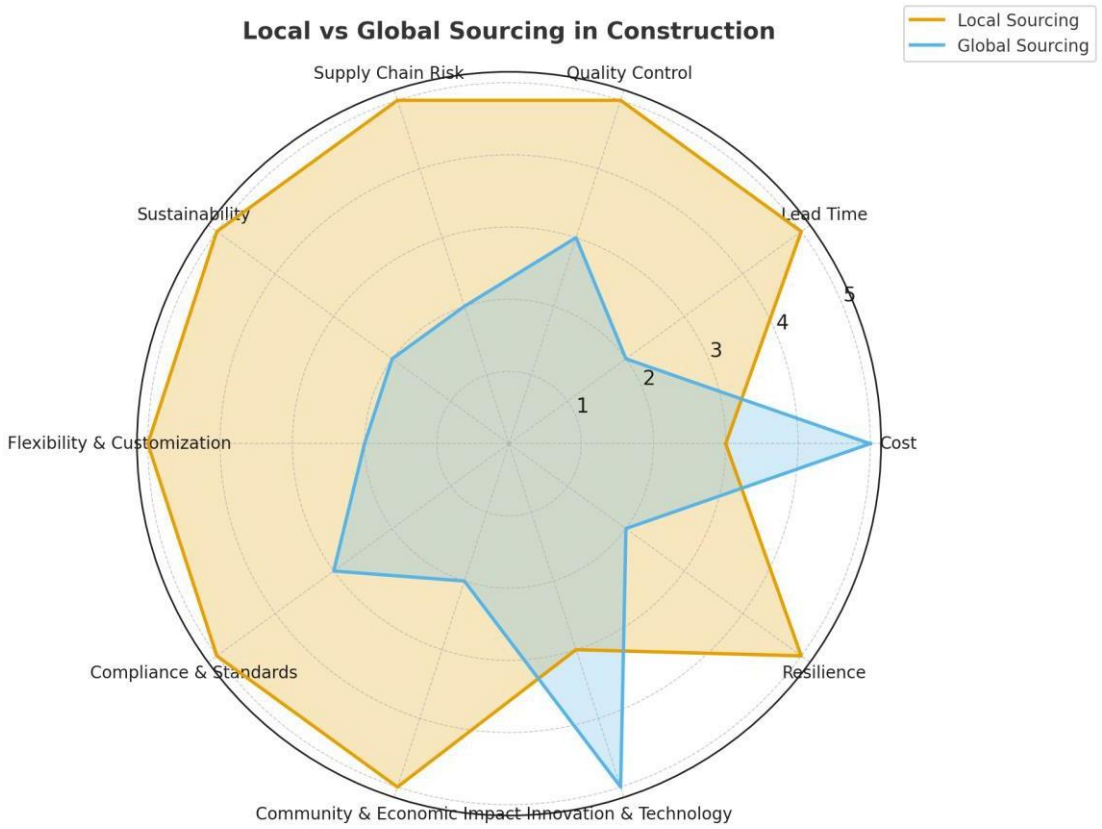
Lastly, Contextual and Regional Factors have significant impacts on sustainability of sourcing. As stressed by Ajiboye et al. (2024) and Stephen et al. (2025), the question of whether a local or a global approach is more feasible is influenced by such factors as geographical conditions, quality of infrastructure, regulatory environment, and the maturity of the local market. An example would be firm located in landlocked areas with potential logistical difficulties which would make domestic sourcing more feasible whereas firms in a port city may have effective importation systems.

Comparison: Local vs Global Sourcing in Construction

Factor	Local Sourcing	Global Sourcing
Cost	Usually higher due to domestic labor and material costs; but savings in logistics and import duties.	Often lower upfront cost due to cheaper production abroad, but shipping, tariffs, and hidden costs may add up.

Lead Time	Faster delivery since materials and services are nearby; less risk of port delays or customs.	Longer lead times due to overseas shipping, customs clearance, and potential geopolitical disruptions.
Quality Control	Easier to monitor suppliers, visit facilities, and enforce standards locally.	Quality may vary; requires more stringent supplier vetting and remote quality assurance.
Supply Chain Risk	Less vulnerable to global disruptions (e.g., shipping delays, political tensions).	Higher risk from currency fluctuations, trade restrictions, or supply chain bottlenecks.
Sustainability	Lower carbon footprint due to reduced transportation; supports circular economy practices.	Larger carbon footprint from overseas logistics, though some global suppliers may have advanced green certifications.
Flexibility & Customization	Easier to adapt to project changes, local codes, and client preferences.	Less flexible; modifications take longer due to distance and communication barriers.
Compliance & Standards	Easier alignment with national building codes, regulations, and certifications.	May face challenges if international materials don't fully meet local codes or certification requirements.
Community & Economic Impact	Supports local jobs, economy, and community relations; often valued in public projects.	May face criticism for outsourcing; less direct benefit to the local economy.
Innovation & Technology	Sometimes limited by local market maturity.	Access to specialized materials, technologies, or expertise not available locally.
Resilience	Stronger in emergencies or urgent projects since suppliers are close by.	Vulnerable to shipping crises, global pandemics, or international conflicts.

Infographic showing the strengths of **local vs global sourcing** in construction across key factors.



2.2. Overview of strategic sourcing

2.2.1. Evolution of strategic sourcing

The breakthrough with strategic sourcing has been able to form the main pillar of contemporary construction procurement and has moved trademark-purchasing strategies to a long-term value and all-inclusive approach to construction procurement. Unlike the traditional procurement where lowest cost or fast delivery is prioritized, Strategic sourcing address the issues of aligning procurement with the objectives of the organization, analyses the supplier markets, optimizing the total costs, and the management of the supplier relationships in a pro-active manner. This transformation is applicable in construction to achieve improved integration of the supply chain actors, increased visibility in the transactions, and operational efficiency. It enables companies to stay competitive through adoption of practices that do not only lower costs but also reduce risks, enhance performance predictability.

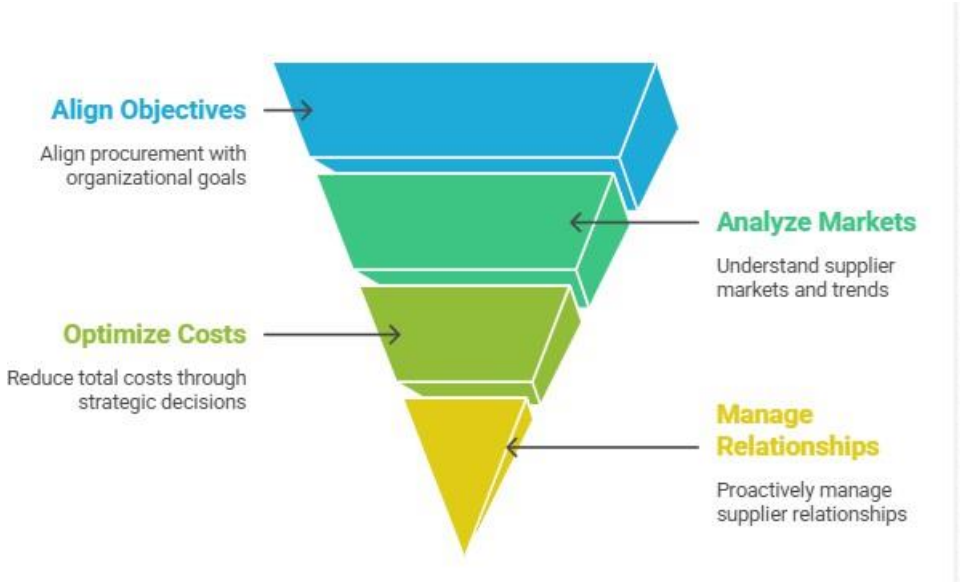
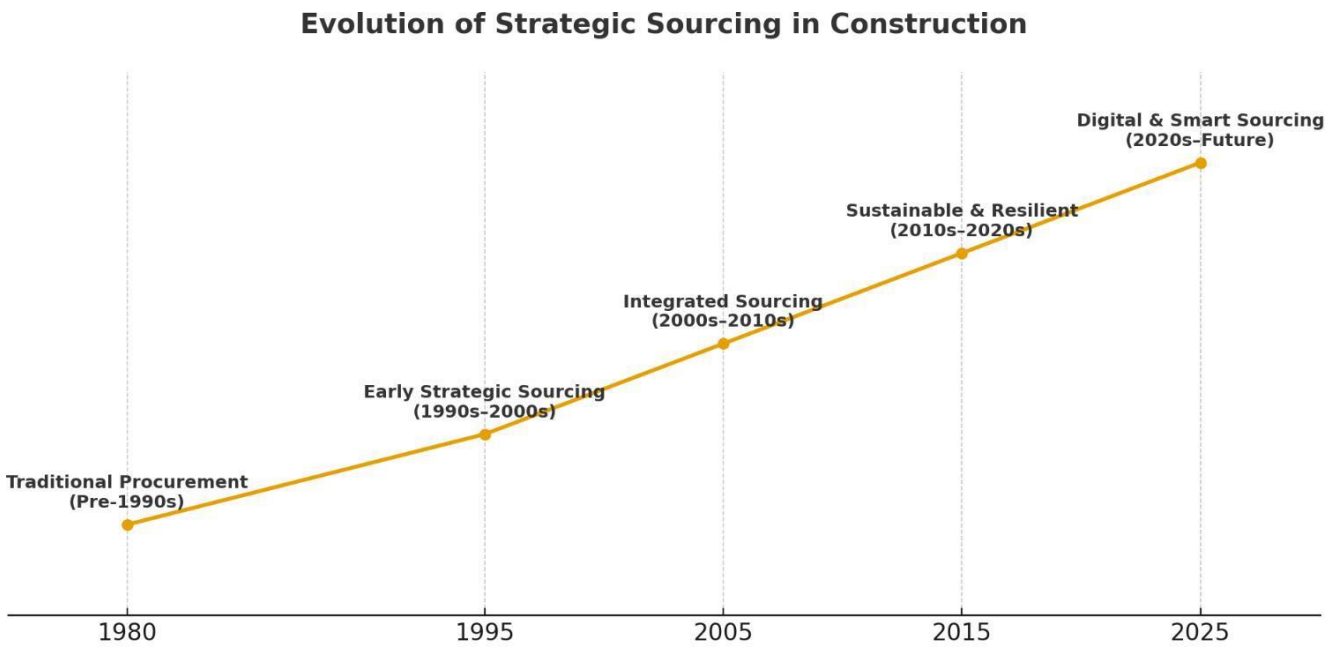


Figure 1 Evolution of Strategic Sourcing in Construction

With an increasing complexity of construction work, an interconnected world of supply chains, and the popularity of resilient infrastructure, strategic sourcing has become more unavoidable. Since the typical firm deals with various subcontractors, vendors, and technology providers that span across regions, sourcing is no longer a procurement activity; rather it is a strategic competency. Guan (2023) emphasized that digital procurement projects such as strategic sourcing played a significant role in the convergence of corporate goals with the supplier capacities, particularly, in the context of large-scale Chinese construction companies. This kind of alignment leads to improved responsiveness to the changing market conditions, regulatory requirements and client expectations.

Strategic sourcing is also able to identify and develop ways to get strategic suppliers and uses to promote innovation by having a collaborating relationship, and will be able to sustain by having ethical sourcing. The research done by El Farouk et al. (2024) highlights that the adoption of strategic sourcing models within the institutions in the sphere of the public sector, in this case, hospitals, allowed optimizing the use of resources and providing better services. With the construction industry under pressure to minimize environmental impact in conjunction with time and discharge protection, strategic sourcing is the roadmap to achieve cost, time, quality and sustainability.

Timeline of Strategic Sourcing Evolution



- **Traditional Procurement (Pre-1990s)**

Focus on lowest cost suppliers.

Short-term, transactional relationships.

Limited consideration for quality, sustainability, or innovation.

- **Early Strategic Sourcing (1990s–2000s)**

Emergence of supplier evaluation and vendor management.

Cost still primary driver, but quality and reliability gained importance.

Introduction of international/global sourcing to reduce costs.

- **Integrated Sourcing & Supply Chain Management (2000s–2010s)**

Shift towards long-term partnerships and collaboration.

Greater emphasis on risk management and just-in-time delivery.

Growing use of digital tools for procurement efficiency.

- **Sustainable & Risk-Resilient Sourcing (2010s–2020s)**

Environmental impact, carbon footprint, and ethical sourcing become priorities.

Increased focus on resilience against global supply chain disruptions.

Hybrid strategies (mix of local and global sourcing).

- **Digital & Smart Sourcing (2020s–Future)**

Adoption of AI, block chain, and predictive analytics in procurement.

Focus on transparency, automation, and real-time supplier risk monitoring.

Net-zero and ESG goals drive sourcing decisions.

2.2.2. Core Concepts

The evolution of strategic sourcing in construction is deeply rooted in the industry's recognition that traditional procurement models were ill equipped to manage growing complexity and risk. The earlier models were mainly concerned with short-term type transactions without much regard to supplier performance or supplier innovation or costs of the whole life cycle. Procurement evolved over time to be a professional with the ability to affect the profitability, quality, and project delivery schedules. The implementation of the enterprise resource planning (ERP) systems and performance dashboards enabled companies to monitor the processes associated with the procurement and suppliers in real-time, which led to the emergence of the integrated supply chain management (SCM) models (Matsane et al., 2022).

Advances in technology and worldwide shocks, particularly in the wake of COVID-19 pandemic, boosted the transformational process of the strategic sourcing paradigm. Logistic and supplier disruptions made industrialized, one-source reliance questionable, and firms began using diversified, high-stamina supplies practices. This transition could be justified with the research insights offered by Mansoor et al. (2022), who evidence that an optimization of a supply chain via strategic sourcing vastly lowered the delays in a project and enhanced the overall quality of a project. Consequently, procurement, rather than the reactive support stream it used to be, became a proactive strategic stream that can be measured with relation to the project outcomes.

2.2.3. Strategic sourcing Challenges in the Digital Age

In the core, strategic sourcing is based on the principles of alignment, analysis, and agility. Alignment involves making sure that the procurement goals are aligned with the goals of the whole organization whether in terms of cost efficiency, sustainability or innovation. This involves the cross-functional cooperation of procurement departments, project administration as well as financial schedulers. Analysis deals with analyzing supplier markets, cost drivers and total cost of ownership (TCO). It changes this short-term price thought to the point that it changes procurement behavior to produce long-term value.

Agility, being another important concept, allows procurement teams to act in a matter of time concerning the changing conditions in the marketplace or project needs. The demands forecasting tools, supplier segmentation, e-procurement system permits the firms to switch sourcing strategies without affecting the delivery of various projects. This segmentation of suppliers is especially critical in construction when contractors use both critical and non-critical suppliers. High-risk and high-value suppliers are usually handled with the help of performance-based agreements and alliances, whereas the transactional ones can be integrated in the method of automated procurement (Nsaif et al., 2023).



In summary, Strategic sourcing in the Digital Age for construction is challenged by data fragmentation, cybersecurity risks, uneven adoption, poor integration, skill gaps, AI ethics, and cost barriers. While digitalization promises efficiency, without addressing these challenges it can actually amplify risks and inequalities.

2.3 Overview of sustainability in procurement

2.3.1. Evolution of sustainability in procurement

Sustainability in procurement has evolved, as it is no more a compliance-focused operation to a proactive and value creation strategy within the construction sector. At first, it was all concentrated mainly on complying with regulatory principles and reducing negative effect is more separated procurement policies. Nonetheless, the contemporary strategy combines economic, social and environmental goals in all stages of the sourcing process. It is believed that construction companies now should do more than just meet the minimum requirements and support sustainable targets, such as alleviating climate change impacts, sustainable labour practices, and local community economic growth. Ahmed et al. (2023) believe that such

transformation becomes crucial in curbing the problem of cost overruns, which are usually associated with wasteful, unsustainable sourcing practices.

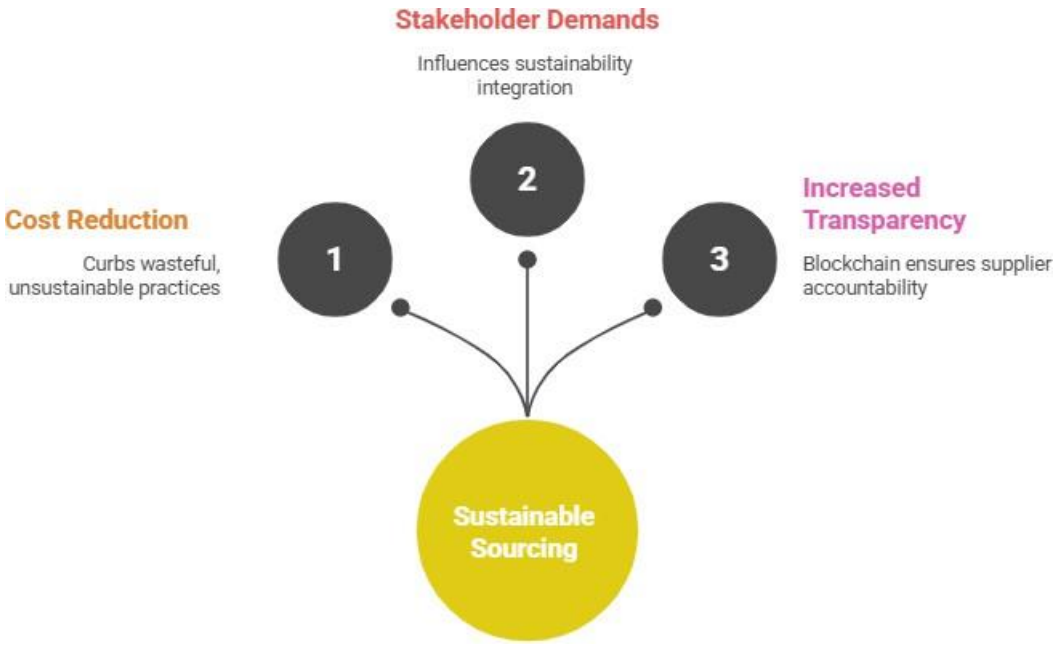


Figure 2 Sustainable Procurement Drives Value Creation

Changing market expectations and demands made by stakeholders also influence the integration of sustainability into the procurement. The Brisbane Olympics is one of the examples of public infrastructure projects that show an increasing emphasis on using procurement as a driver of sustainable development (Day, 2025). Sustainability indicators are incorporated in the criteria of evaluating suppliers of these projects and contractual clauses are used to enforce environmental and social conformity. The change is further being accelerated by the emergence of distributed ledger technologies (DLTs) namely block chain, which allows not only transparency of supplier practices but also sustainability of inputs throughout the chain (Bello et al., 2024). The developments denote a rising perception that procurement is not solely a cost center but an able device of sustaining value production.

2.3.2. Core Concepts

The main concepts that support sustainability in procurement are stakeholder, lifecycle costing, triple bottom line (TBL) and traceability. TBL system promotes procurement choices, which put into consideration economic performance, environmental stewardship, and social responsibility. This implies that procurement professionals cannot rely anymore on supplier-assessment based on costs and quality only but also based on environmental practices and ethical labor standards. Isang et al. (2025) emphasize the enhancement of credibility and trust within the stakeholders in the Nigerian construction industry through aligning the procurement strategies with the Sustainable Development Goals (SDGs). Such an alignment promotes a systemic view of supplier selection, management of contracts and performance measurement.

Other fundamental concepts are lifecycle costing, whereby the overall environmental and financial implications of a product, including extraction of raw materials, use and disposal, are taken into account when procuring the object. Matsane et al. (2022) note that integrated supply chain management (SCM) model involving lifecycle analysis leads to long-term efficiency and sustainability in the construction. In the interim, traceability solutions, such as block chain, offer certifiable materials, which enables organizations to make sure that their sustainability principles will be met all through the supply chain. These ideas give rise to a culture of transparency, accountability, and fit to organizational sustainability objectives in the procurement environment.

2.3.3. Sustainability in procurement Challenges in the Digital Age

Although there has been improvement in integrating the concept of sustainability within procurement, a number of obstacles still exist-particularly regarding digital transformation. Digitization of systems is usually bogged down by the high cost of the various digital tools being used like block chain, e-procurement sites, and supplier evaluation software, as well as digital literacy and interoperability issues. According to Bello, Homer, Warner-Garcia, and Tariq (2024), they note that the barriers are especially troublesome in the fields of developing economies, where the infrastructure and regulative model does not allow the application of advanced digital solutions. Consequently, procurement units can hardly introduce any effective sustainability metrics or confirm the supplier compliance on a real-time basis, which prevents their sustainability programs to be effective.

Resistance to change among the organizational cultures and stakeholders is another major issue of concern. Day (2025) noted that reform of procurement in large transformation of the government project is frequently frustrated by internal resistance ground-down cases and incorrect incentives. This opposition lags in the implementation of the new tools and frameworks aimed at enhancing sustainability. Moreover, the experienced staff is in great demand to provide control over the meeting point of three factors: procurement, sustainability, and digital technologies. Failure to have the right talent and training means that organizations may not carry out the implementation of their sustainability objectives with ease. Sustainability does not represent a technical issue but it is rather managerial issue, as Ahmed et al. (2023) observe, this means consistent leadership, cross-functional cooperation, and a long-term investment.

Sustainability in Procurement: Challenges in the Digital Age

1. Material Sourcing & Environmental Impact

- **Challenge**: Construction relies on carbon-intensive materials like cement, steel, and glass. Procuring eco-friendly alternatives (e.g., recycled steel, low-carbon cement) is difficult due to limited availability and higher costs.

- **Digital Age Factor**: Digital tools (BIM, AI, blockchain) can track material origins, but adoption is uneven across the industry.

2. Supply Chain Complexity & Transparency

- **Challenge**: Construction projects involve hundreds of suppliers, subcontractors, and logistics providers across multiple tiers.
- **Digital Age Factor**: Even with digital platforms, ensuring full visibility of labor standards, emissions, and material certifications across all tiers is difficult.

3. Data Integration & Quality

- **Challenge**: Sustainability requires lifecycle data (LCA) on materials, energy, and waste. However, suppliers may provide incomplete or inconsistent data.
- **Digital Age Factor**: BIM and IoT sensors generate large datasets, but integrating them into procurement decisions remains a challenge.

4. Greenwashing & Certification Issues

- **Challenge**: Some suppliers claim to provide "sustainable" materials without verifiable certifications.
- **Digital Age Factor**: Digital marketing amplifies false claims, and procurement teams struggle to verify authenticity across borders.

5. Cost vs. Sustainability Pressures

- **Challenge**: Clients often prioritize budget and timelines over sustainable sourcing.
- **Digital Age Factor**: Digital procurement tools optimize for cost and efficiency, but may overlook long-term sustainability benefits (e.g., reduced lifecycle costs).

6. Supplier Capability Gaps

- **Challenge**: Many small and medium-sized construction suppliers cannot meet strict sustainability or digital reporting requirements.
- **Digital Age Factor**: Adoption of digital procurement platforms can unintentionally exclude local, smaller suppliers, affecting inclusivity and resilience.

7. Regulatory & Standards Compliance

- **Challenge**: Construction firms face evolving sustainability regulations (e.g., EU Green Deal, carbon disclosure requirements, LEED/BREEAM standards).
- **Digital Age Factor**: Digital compliance tools exist but are costly to implement and require skilled staff to manage.

8. Cybersecurity & Intellectual Property Risks

- **Challenge**: Construction projects often use cloud-based digital procurement and BIM platforms.
- **Digital Age Factor**: Cyberattacks on these systems can leak sensitive data, delay projects, and undermine sustainability initiatives.

2.4 Overview of emerging technologies in sourcing

2.4.1. Evolution of emerging technologies in sourcing

With the introduction of new technologies in the sourcing arena, the process of managing the procurement and the supply chain business in construction firms has dynamically changed. During the early years, the application of technology in procurement was minimal and was mainly in the form of limited ERP systems and digital spreadsheets, only applied to store records. But by the time the world was more widely globalized and the supply networks more complex a need was felt to have more advanced tools which would increase speed, precision and strategic vision. This has seen the implementation of advanced mechanisms, including machine learning algorithms, data analytics tools and multi-criteria decision-making (MCDM) models. The article by Cheni and Tai (2023) reveals that the integration of machine learning and MCDM makes it possible to help construction companies to make their project portfolio optimization on multiple project performance criteria, substantially enhancing the resource allocation.

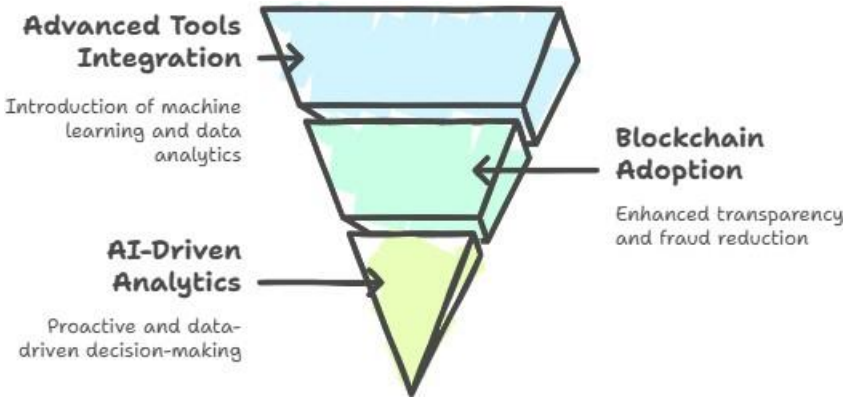


Figure 3 Evolution of Technology in Construction Sourcing

The recent developments introduced even more dynamic technologies in the procurement landscape, such as block chain, Internet of Things (IoT), and artificial intelligence (AI). Through these tools, transparency, visibility, and automation of procurement processes are possible in real-time. An example of this is Block chain, which is being used with greater frequency to record the inalterable record of procurement transactions, therefore, alleviating fraud and demonstrating greater supplier confidence (Badi, 2024). Correspondingly, less stupid predictions and supplier assessment are now aided by AI-driven analytics, which has allowed the companies to become proactive and data-driven. This development is part of a wider movement towards digitalization in construction, where sourcing is no longer a back office of any construction business but in actual sense the strategic and sustainable enabler of projects.

2.4.2. Core Concepts

The rise in new technologies within sourcing is based on a few overarching ideas, namely: automation, data integration, predictive analytics, and digital traceability. Automation streamlines the creation of purchase orders and processing of invoices and the onboarding of suppliers, which saves a lot of time and enable procurement teams to work on higher-value tasks in their role. The involvement of artificial intelligence (AI) ensures that all their tasks are optimized. Data integration software will guarantee that the information on various platforms, including supplier database, logistics tracker, and financial systems, is centralized and available to make informed decisions. Huni et al. (n.d.) claim that the existence of such relationships with suppliers can be supported by a certain level of strength when such technologies are utilized, as they allow feasible communication, the persistence of tracking and feedback.

The current focus on the procurement transformation is the use of predictive analytics and artificial intelligence that lets organizations predict demand, evaluate risks and find the most efficient sourcing strategy. Block chain is one of the fundamental technologies that could be used to achieve traceability and accountability especially in large-scale or multiple-vendor construction projects. As per Badi (2024), inter-organizational alignment in supply chains is one of the elements that thus convey block chain in leading to value co-creating and mitigation of risks. Moreover, as noted by El Farouk et al. (2024), centralized sourcing portfolios can also be used in the context of potentially challenging activities, such as public healthcare projects, by making the procurement more convenient even when working in a complicated institutional environment. The combined effect of these core technologies can help drive procurement functions to be more agile, transparent, and aligned to the rest of the organization intentions.

2.4.3. Emerging technologies in sourcing Challenges in the Digital Age

Nevertheless, there are challenges that plague the application of new technologies in sourcing, particularly in the construction sector despite its potential. The technical skill and change management are one of the big obstacles. A wide range of procurement workers lack exposure to how AI, block chain, or MCDM tools operate and can be integrated, and thus are used underutilized or not at all. According to Nsaif et al. (2023), although the current state of efficient supply chain practice has benefited the outcomes of women in construction significantly, there are still gendered and organizational obstacles towards the adoption of technology. The so-called digital divide, not only among companies but also even within departments, increases inequalities in technology access, training, and acceptance and restraints effects of such tools.

There is also resistance due to cost and interoperability problem. New technologies involve considerable initial expenditure to build infrastructure, license software, and educate personnel, something that is out of reach of smaller and middle-sized building companies. In addition, current legacy systems might not be integrated with new digital platforms, causing both integrations and data silos problems. Such difficulties are also complicated by cybersecurity risks and data privacy, particularly when it comes to the block chain-

enabled systems. Organizations need to incorporate a phased digital strategy, which involves stakeholders, capacity building of them, and cross-functional alignment to mitigate these obstacles. Effective digital sourcing in the construction sector requires a collaborative ecosystem, and procurement professionals, IT experts, and project managers collaborate to ensure that technology institute is aligned with organizational goals (Cheni and Tai, 2023).

Key Emerging Technologies in Construction Sourcing

- Building Information Modelling (BIM) → **Enables digital representation of materials, lifecycle tracking, and sustainable sourcing.**
- Blockchain → **Enhances supply chain transparency, traceability, and trust in supplier data.**
- Artificial Intelligence (AI) & Machine Learning → **Predicts material demand, optimizes supplier selection, detects risks (e.g., price volatility, carbon footprint).**
- Internet of Things (IoT) → **Tracks materials in transit, monitors equipment emissions, and ensures compliance with sustainability standards.**
- Digital Twins → **Simulates construction projects, allowing evaluation of procurement choices and lifecycle sustainability before execution.**
- E-Procurement Platforms → **Streamline supplier management, tendering, and contract administration.**
- 3D Printing (Additive Manufacturing) → **Enables local, on-demand production of components, reducing logistics and material waste.**
- Robotics & Automation → **Improves efficiency and reduces material wastage in sourcing and site operations.**

Challenges in the Digital Age

1. Integration & Interoperability

- Multiple digital tools (BIM, IoT, block chain) often don't integrate seamlessly.
- Construction companies face difficulties in unifying procurement data across platforms.

2. High Implementation Costs

- Emerging technologies (digital twins, block chain, AI) require major upfront investment.
- Small and medium suppliers often lack resources to adopt these tools, creating inequality in sourcing.

3. Data Quality & Reliability

- AI and block chain depend on accurate data input — unreliable supplier reporting can lead to flawed insights.

- Risk of “garbage in, garbage out” in digital sourcing systems.

4. Cybersecurity Threats

- Digital procurement platforms and BIM models are vulnerable to hacking, ransomware, and data theft.
- Cyber incidents can disrupt sourcing processes and compromise sensitive supplier data.

5. Skills & Workforce Readiness

- Procurement professionals in construction often lack training in emerging digital technologies.
- Industry skills gap slows down adoption and effective use of advanced sourcing tools.

6. Supplier Exclusion

- Smaller/local suppliers may be left out due to lack of digital infrastructure.
- Risk of reinforcing dependency on large, tech-savvy suppliers only.

7. Regulatory & Legal Barriers

- Use of blockchain and AI in procurement is still ahead of regulatory frameworks.
- Compliance with international standards for sustainability, data privacy, and e-procurement is complex.

8. Resistance to Change

- Traditional construction firms may resist digital transformation due to cultural inertia.
- Concerns about disrupting long-standing supplier relationships.

2.5 Overview of Local vs global sourcing

2.5.1. Evolution of Local vs global sourcing

The local and global sourcing trend in the construction sector is a manifestation of trends in general in globalization, supply chain management and risk opinion. Conventionally, several companies chose to use global sourcing because of costs reduction, widely distributed suppliers, and availability of certain materials or technologies that are not found on the local market. The method however did pose risks to the firms on issues of logistics, geopolitical unrest, and long lead times. Ever since global supply chains have emerged, particularly, in the 1990s and 2000s, procurement has taken a more international focus. However, the impact of disruptions caused by, in this case, COVID-19 pandemic influenced many construction companies to rethink those dependencies and source synergies could shift due to this rebalancing of sourcing strategy. According to Guan (2023), the digitalization of procurement and the localization of supply have become these processes as a flexible method of adapting to international vulnerability, especially in the Chinese construction industry.

Over the past years, there is increasing interest in implementing a hybrid sourcing strategy by combining local and global sourcing, as it is flexible and resilient. The strategy can help construction companies take advantage of costs advantages and international innovation as well as delivering to schedule and with less disruption by using local sources. The circular economy movement that has urged companies to get resources locally so that they can minimize environmental impacts and reintegrate with the local economies has prompted this trend. Zandee et al. (2024) point out that working with local suppliers leads to more sustainable results in terms of circular frameworks and contributes to sound societal development. The change in sourcing strategies will be subjective, too, especially as companies focus ever more on resilience, sustainability, and responsiveness.

2.5.2. Core Concepts

The fundamental issues in local versus global sourcing revolve around trade-offs in relation to cost, risk, time, quality and sustainability. Global sourcing is generally characterized by cost minimization by labor and production arbitrage by means of exploiting economies of scale across borders. It provides access to a wider selection of material and technologies however may bring complexities to the supply chain and may have increased lead times. On the other hand, sourcing locally emphasizes on short distance, flexibility and less environmental wastes. It encourages quicker deliveries, more convenient quality permission, and improved community connection. According to Mansoor et al. (2022), flexibility of supply chain configuration should be determined by balancing such variables based on scope, risk tolerance and strategic priorities of the projects.

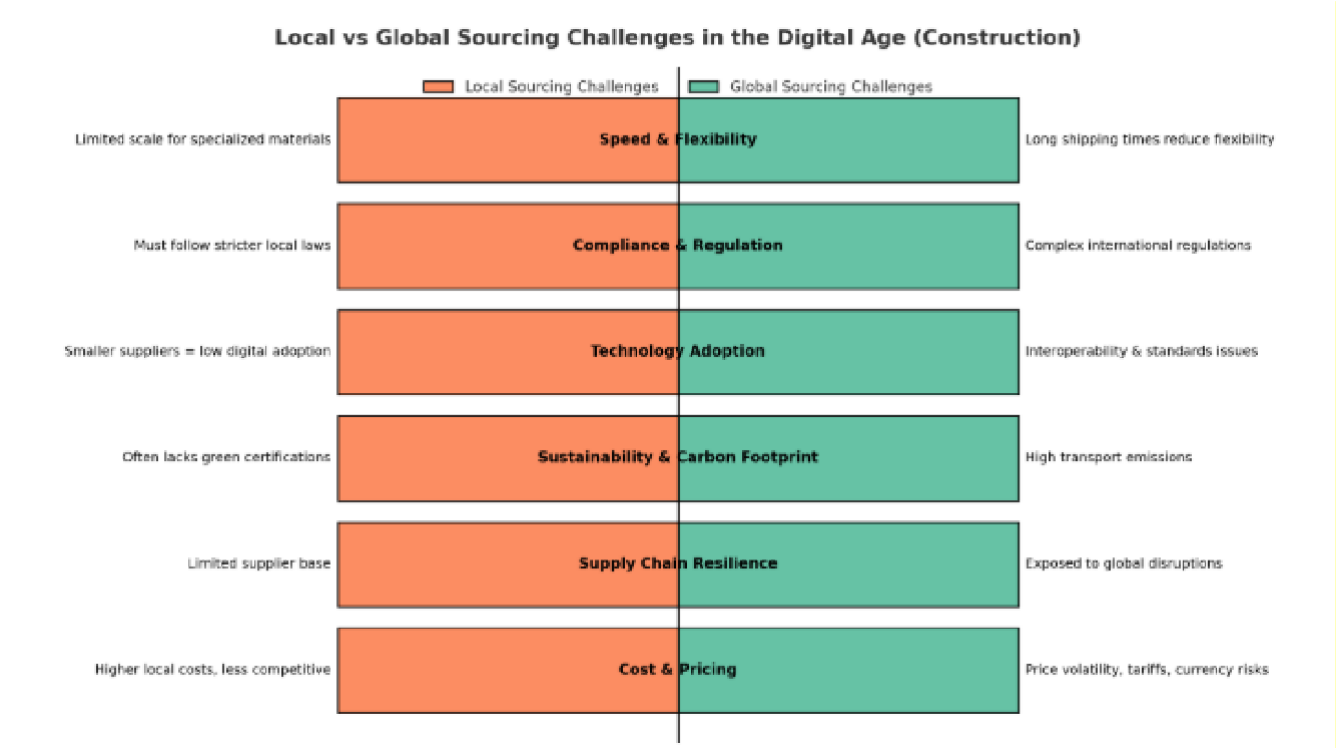
Digital maturity and the ability to perform data analytics also inform strategic decision-making in sourcing. According to Guan et al. (2025), fuzzy-based MCDM techniques assist companies in determining whether they should adopt a local or global strategy along the different performance parameters. These approaches enable the decision-makers to measure the complex trade-offs, and incorporate qualitative information, or the impressions, into the sourcing models, e.g., supplier reliability and sustainability behaviors. Moreover, institutional and regulatory environments also influence the sourcing decisions and certain governments tend to encourage the local procurement of public construction contracts because local industries need to be boosted. Due to this, a sourcing approach has to be dynamic, evidence-based and should meet corporate and social objectives.

2.5.3. Local vs global sourcing Challenges in the Digital Age

Local against global sourcing comes with a number of challenges in the digital age calibrated to data integration, supply chain visibility as well as digital inequality. The international supply chains are prone to rely on complicated digital platforms to organize logistics, payments, and compliance across the borders. However, irregularity in digital infrastructure across borders and even providers can stand in the way of smooth functioning of these systems. Guan (2023) notes that the availability of the most modern

technologies of procurement in emerging economies limits the possibilities of local suppliers, depriving them of the opportunity to compete with global vendors. This poses an obstacle to complete adoption of hybrid sourcing structure in which local and global associates are supposed to be equally competent in technology.

Besides, with less transparency and lax physical enforcement in certain areas, the risks relating to sustainability can be more challenging to address under a global sourcing concept. Although the introduction of a block chain may be seen as an effective mechanism to improve the supply chain traces and mitigate the onset of sustainability risks, globally, the application of a block chain is still not widespread enough (Gu et al., 2025). Conversely, issues of capacity, scalability, and expenses may arise when interacting with the local sourcing. The smaller local suppliers might not have the operational and financial stability needed to implicate a large construction project. The authors believe in the concept of partnerships and capacity-building activities to invest in local supply chains and include them as part of a wider sustainability approach (Zandee et al., 2024). The more the excruciating sourcing decisions go digital, the more these challenges will become essential determinants to developing resilient, inclusive, and effective procurement networks.



2.6. Current state of strategic sourcing in construction industry

The area of strategic sourcing in construction is rapidly changing, and it is influenced by economic changes, technological developments, and more attention given to sustainability. Procurement has ceased to be a

simple transactional exercise since construction projects are increasingly complex and diversified, and thus procurement is changing into a strategic asset that helps in project success. Nonetheless, even as strategic sourcing rises in significance, a number of challenges are still faced, particularly those that pertain to supply chain management, its risks, and the utilization of new technology (Singh et al., 2024; Ghosh, Mandal, & Ray, 2021). Unavailability of qualified labour, unstable material prices and interruption due to global events such as COVID-19 pandemic have shown that traditional sourcing methods have their shortcomings and that more flexible and robust sourcing strategies should be used.

The increasing complexity of construction projects has also led to the improved strategic sourcing practices, which are not only concerned with cost minimization but also incorporate, the elements of long-term planning, management of supplier relationships, and risk management. Stephen et al. (2025) observed that strategic sourcing extends the selection of suppliers based on price. It implies a matching of the procurement strategies, with the general goals within the organization, quality and schedule. Conversely, the historical approach of the procurement process was too closely oriented towards the short-term strategic objectives, including the acquisition of the most advantageous terms of the materials, which usually resulted in the low-quality and unwarranted delays and inefficiencies in the projects (Singh et al., 2024). The change of orientation towards strategic sourcing enables the construction companies to control their procurement activities more actively with the outcome of improved projects.

However, the present situation with strategic sourcing within the construction sector leaves much to be desired regardless of its being of strategic concern. The problem of split supply chain especially where there is a large-scale project with numerous suppliers and contractors is a major challenge. Failure to orchestrate between different stakeholders in a supply chain normally can cause hiccups, cost escalation, and quality problems (Stephen et al., 2025; Sivasubramaniam et al., 2024). As an illustration, the construction sector continues to use siloed approaches to supply chain, and this can create inefficiency, especially when suppliers do not support the agreed concentration in terms of time and quality. Although a few construction companies have already achieved success in including procurement into general project planning, there are also numerous companies that still do not see the strategic importance of well-managed supply chain (Singh et al., 2024).

Sustainability in strategic sourcing processes has become one of the most arduous and constructive matters in the construction business. Due to the escalating pressure on stakeholders towards the use of green building materials and the process of sustainable construction, there is a trend in an emphasis on sustainable sourcing. Nonetheless, the accomplishment of this goal is not devoid of challenges. Sustainable materials are mostly expensive, suppliers are not transparent, and there are few green alternatives; these are some of the biggest obstacles to sustainable sourcing practices (Sahu et al., 2023; Ajiboye et al., 2024). Nevertheless, the advantages of sustainable procurement cannot be disputed despite such challenges. Companies that

manage to embrace sustainability in their procurement policies are more likely to experience an improved brand reputation, better adherence to environmental rules and regulations, as well as trust towards the company (Cherian et al., 2021; Sahu et al., 2023).

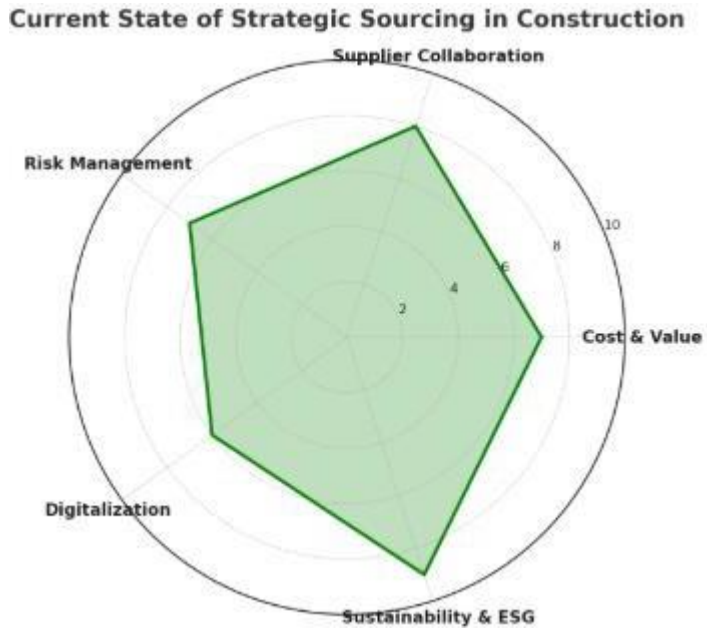
Along with sustainability, the implementation of emerging technologies is another significant driver of the present situation with strategic sourcing in the construction industry. Artificial intelligence (AI), machine learning (ML), and block chain are technologies that can transform the way we procure stuff and make some significant changes in the domain, like increasing transparency, minimizing frauds, and supply chain visibility (Bello et al., 2024; Tohfa et al., 2025). Nevertheless, there are critical issues involved in the embedding of these technologies into current procurement systems. Some of the barriers that are widely experienced by construction companies, especially small and medium-sized enterprises (SMEs) include high implementation cost, absence of technical expertise, and resistance to change (Tran et al., 2024; Sahu et al., 2023). These challenges can delay the adoption of digital procurement solutions, thereby hindering the industry's ability to fully capitalize on the advantages offered by new technologies.

The other critical area of procurement in the construction industry is the component of supplier relationship management (SRM) in strategic sourcing. In large-scale construction, it is important to have quality materials and services at all times to save on project delays and proper SRM practices will help achieve this. In their study, Ofori et al. (2025) point out that strategic sourcing assists in the establishment of long-term relationships with suppliers based on trust, transparency, and mutual objectives, which, consequently, guarantees the project performance. Nevertheless, a lack of understanding of the importance of relations with suppliers makes various construction companies overlook the potential of suppliers and see them as the transactional party but not the strategic partner (Zerihun & Wondemalem, 2022). This disunity may lead to lack of proper communication, delays and even raised costs, which will unfortunately compromise the overall achievement of construction projects.

Moreover, the COVID-19 pandemic has revealed how weak global supply chains are and has prompted most construction companies to reflect on their sourcing strategy. During the pandemic period, the risks of working with a just-in-time delivery system were revealed and the need to have diversified sources strategies, which will cope with global disruptions was highlighted (Sahu et al., 2023). To address these issues, numerous construction companies have begun to transition to local sourcing as a means of decreased reliance on international vendors and to eliminate the risks that domestic supply chain has on international ways (Brunner et al., 2023; Ajiboye et al., 2024). Local sourcing has various benefits such as a reduced lead-time, transportation cost, and supply chain strength during supply chain disruptions. Nevertheless, it is as well accompanied by trade-offs, including increased material prices and scarcity of materials whose supply is limited, especially non-local ones (Sharifzada & Deming, 2024).

Notwithstanding these obstacles, the implementation of strategic sourcing in construction procurement practices comes with many advantages especially when it comes to cost management, project delivery and sustainability. The demand in regards to more innovative, flexible, and resilient sourcing strategies will become crucial as the industry is still developing. A rise in the importance of sustainability, new technologies implementation, and the emphasis on supplier collaboration will be the primary factors of the future of strategic sourcing in the construction industry (Stephen et al., 2025; Ajiboye et al., 2024). However, the industry's ability to overcome the barriers to implementing these practices will largely determine the success of strategic sourcing in the coming years.

The present position of the strategic sourcing industry in the field of construction has a mixture of advancement and disadvantages. Even though some companies have achieved much progress in the areas of more strategic and sustainable procurement, there are still numbers of barriers to overcome. They involve the problems of supply chain coordination, the incorporation of the new technological advances, the embrace of green sourcing, and overseeing the relations with suppliers. The only way that construction companies can overcome these obstacles is by taking a proactive approach of making innovation part of their processes, enhancing cooperation with suppliers and building more resilient and flexible sourcing strategies, which are capable of withstanding subsequent disruption. Ultimately, the success of strategic sourcing in the construction industry will depend on the industry's ability to adapt to changing market conditions, stakeholder demands, and technological advancements (Singh et al., 2024; Sahu et al., 2023).



Here is a radar chart that visualizes the current state of strategic sourcing in construction. It highlights relative maturity across key areas: cost & value, supplier collaboration, risk management, digitalization, and sustainability/ESG.

In summary, the current state of strategic sourcing in construction is digitally enabled, sustainability-driven, and risk-conscious. While cost control remains important, procurement teams now focus on long-term value, ESG compliance, supply chain resilience, and collaboration.

2.7. Challenges of strategic sourcing in construction industry

Strategic sourcing has already become a hot topic in the construction sector as one of the fundamental sources of cost control, efficiency, and sustainability. Nevertheless, its increasing significance notwithstanding there is still a considerable issue on the part of construction firms in incorporating strategic sourcing practices in their activities. The challenges fall in a broad spectrum, which includes technology integration, relationship with suppliers, cost control and sustainable practices. This section critically examines the key challenges faced by construction firms in adopting strategic sourcing and discusses how these issues affect the industry's overall performance.

One of the most pressing challenges in the construction industry's strategic sourcing is the integration of emerging technologies such as block chain, artificial intelligence (AI), and digital procurement platforms. These technologies can make a big impact in sourcing efficiency and transparency however there has not been a high rate of adoption of the same because of numerous challenges. Many construction companies, particularly those with small and medium enterprises (SMEs), can hardly implement these technologies because these systems are technically complex, and their implementation is costly (Suliman Eissa Mohammed & Jamal Salem Alharthi, 2022). Moreover, there is also an absence of trained/talented individuals to maintain and work with such advanced systems, which makes the situation worse. Li et al. (2024) identify the ability of the firm to manage the digital tools and promote the data flow throughout the supply chain as indispensable to carry out the successful incorporation of the information technology in the construction project management. Nonetheless, the current digital literacy disparity in the sector is an obstacle to the comprehensive application of the technologies, which makes numerous companies dependent on the traditional procurement methods that lack the flexibility and the transparency that can be provided by the digital systems.

The absence of data integration at diverse platforms also makes the implementation of strategic sourcing complicated. Gurgun et al. (2024) stated that numerous construction companies still apply different systems in procurement, inventory control, and supplier assessment. The outcome of this poor integration is in competencies, inaccuracy in information processing, and delay in decision making. This division of data with regard to construction becomes a major impediment to the successful execution of strategic sourcing practices as the industry embarks in increasing digitalization. Lack of ability to centralize data of the procurement complicates the entire process of monitoring the performance of the supplier, tracking project expenses and adherence to the delivery of materials, which are key elements of strategic sourcing (Behboudi & Karimian, 2022).

The nature of supply chain management in construction industry is complex because a variety of stakeholders are involved in this industry such as suppliers, subcontractors and service providers and all these players are in a fragmented environment. The threat of a supply chain interruption, whether caused by geopolitical happenings, natural catastrophes, or financial turbulence, is a significant issue the construction companies should consider in case they attempt to deploy strategic sourcing (Osunsanmi et al., 2022). Such interruptions are likely to result in delays during the procurement of material, cost blowout, as well as a reduction in the performance of the project in general. To take one example, the COVID-19 pandemic revealed how exposed the global supply chain was, and construction firms had to re-evaluate their sourcing practices. One of the responses that have been undertaken to reduce the risks has been the shift towards local sourcing as proposed by Yildiz et al. (2024). However, this greater use of local suppliers may have an adverse effect in some cases where you end up paying more because local suppliers cannot cut it in terms of the volume or quality of their products in large constructive works.

Conversely, the global sourcing approaches usually carry with them their problems, including a longer lead time, the costs of transport will rise, and the international contracts and laws will be complicated (Albeshr, 2025). Although global sourcing can be profitable in terms of costs, it is also an advantage that exposed the construction companies to high risks associated with currency changes, political instability, and delays in the supply chain (Gurgun et al., 2024). The local and global sourcing, which has its own risk; benefits equally need tact and flexibility to procure sources. To construction firms, the question is how to balance these competing factors to ensure that construction projects and activities are executed smoothly within cost and periods.

The building business needs an effective SRM in order to achieve success in strategic sourcing. Nonetheless, very important is the fact that most construction companies still find it difficult to establish and sustain meaningful and long-term relationship with suppliers. Ahmed et al. (2022) state that traditional procurement approaches tend to be cost-based and short-term orientation-oriented instead of enhancing long-term relationships with suppliers. It may incur lack of collaboration, bad communication and an inability to take chances on innovations. Strategic sourcing is, on the other hand, a relational methodology, and the suppliers are perceived as partners that can help the project triumph (Osunsanmi et al., 2022).

This competitiveness of construction industry makes the task of constructing these relationships even harder. The significance of the competition in the market is a major issue, as many suppliers hesitate to enter long-term contracts, or spend their resources on building and developing strategic partnerships. In many cases, it leads to short-term intentions of firms regarding procurement processes, which overlook long-term advantages of seeking cooperation and trust with suppliers (Suliman Eissa Mohammed & Jamal Salem Alharthi, 2022). In addition, contracting various suppliers to provide various parts of the project may

result in the fragmentation of the supply chain due to a lack of uniformity in delivery coordination, or material quality (availability, strength, and so on) and maintaining schedule in projects.

The role of sustainability in the construction industry is becoming a major theme of discussion and regulation bodies, customers, and the rest of the society are forcefully making demands to go environment-friendly. Incorporation of sustainable materials in strategic sourcing has, however, shown to be a huge challenge. Sustainable materials are expensive, environmentally certified suppliers are scarce, and construction companies have no visibility into the supply-chain; thus, the construction firms have a problem carrying out green sourcing activities (Albeshr, 2025; Yldz et al., 2024). As much as there is demand increase in sustainable construction, practices many firms are also not willing to use green sourcing practices because they feel that it is costly and difficult to realize sourcing sustainable materials.

Sustainability is an even more challenging task when there are no standardized models to assess the construction materials and processes concerning their environmental impact. According to Behboudi and Karimian (2022), there are no universally agreed sustainability criteria; thus, construction companies cannot evaluate and benchmark the environmental performance of providers and products. Such inconsistency in the measurement of sustainability may cause confusion and duplication in the procurement. More importantly, the lack of a strong mechanism to induce green sourcing further renders a large number of companies incapable of receiving the relevant guidance or incentive to implement sustainable procurement practices (Suliman Eissa Mohammed & Jamal Salem Alharthi, 2022).

One of the biggest problems of strategic sourcing in the construction business is price volatility and in the price of construction materials. During the construction, the construction firms tend to face some issues such as the fluctuating material prices on the global market because of the lack of equilibrium between supply and demand, fluctuating rates, and geopolitical instabilities (Ahmed et al., 2022). Raw materials like steel and concrete have been on the rise in prices, this has placed a great burden to the construction cost budget, and thereby firms have been failing to keep the incurred costs in line with the allotted project costs. Although strategic sourcing tries to comply with these problems by negotiating with the suppliers and reaching long-term contracts, the problem of price volatility is still present.

The aspect of controlling costs is even compounded by having to ensure that there is a balance between procurement efficiency and the set standards of quality. In their attempt to cut costs, other companies might succumb to the temptation of using lower-priced, low-quality materials, which would have an adverse effect on the overall quality of the building project (Osunsanmi et al., 2022). The strategic sourcing herein involves firms striking a fine balance between cost and high qualitative standards. It may lead to cost overruns, slippage and dissatisfaction by clients, which would in turn negate the impressions of strategic sourcing.

Key challenges of strategic sourcing in the construction industry:

1. Supply Chain Complexity & Fragmentation

- Construction projects rely on **multiple tiers of suppliers and subcontractors**, making coordination difficult.
- Lack of visibility beyond Tier 1 suppliers increases risks of unethical sourcing, delays, and quality issues.

2. Cost vs. Sustainability Trade-Offs

- Sustainable and low-carbon materials often carry **higher upfront costs**, creating tension between budgets and ESG goals.
- Whole-life value is still undervalued compared to short-term capital expenditure.

3. Volatile Market Conditions

- Prices of raw materials (steel, timber, cement, energy) are highly volatile due to **geopolitics, inflation, and global demand shocks**.
- Strategic sourcing becomes challenging when suppliers cannot guarantee stable pricing or delivery.

4. Data & Transparency Issues

- Limited adoption of **digital procurement tools** across the industry.
- Inconsistent data quality for supplier performance, carbon footprints, and life-cycle assessments.
- Difficulty in verifying claims (e.g., green certifications, embodied carbon levels).

5. Risk Management & Resilience

- Global events (COVID-19, trade restrictions, and climate risks) highlight vulnerabilities.
- Heavy reliance on single-source suppliers for specialized materials creates **supply risk exposure**.

6. Cultural & Organizational Barriers

- Resistance to moving away from the **"lowest bid wins"** mindset.
- Lack of collaboration between procurement, design, and construction teams.
- Limited training in **sustainable procurement practices**.

7. Regulatory & Compliance Pressures

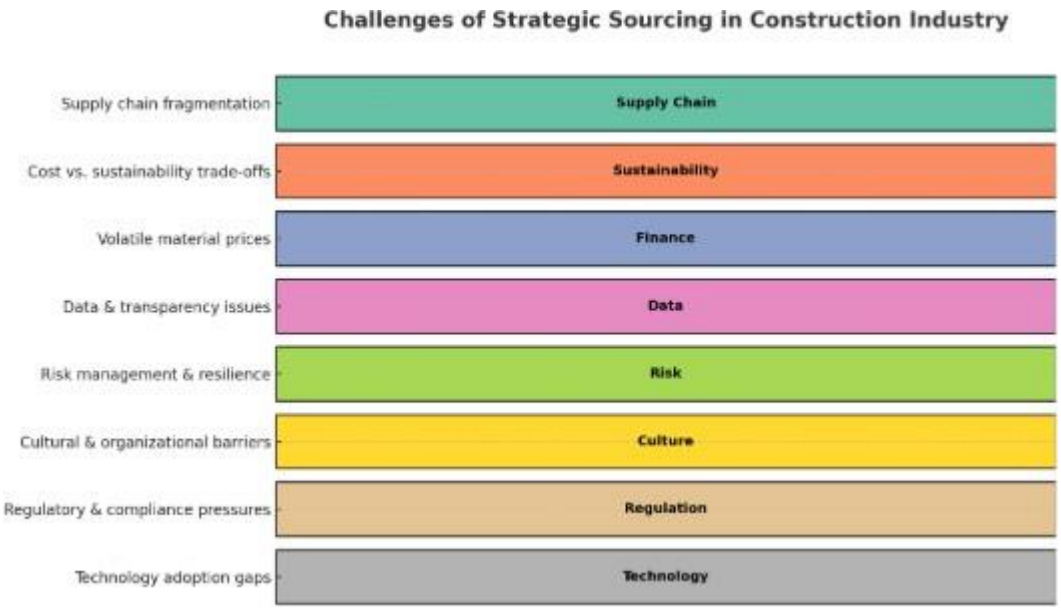
- Governments increasingly mandate **carbon reporting, social value outcomes, and ethical sourcing**.
- Compliance requires additional resources and specialized expertise.

8. Technology Adoption Gaps

- Slow integration of **AI, BIM, block chain, and advanced analytics** into procurement processes.

- Many mid-sized firms lack resources to invest in digital transformation.

In summary, The main challenges for strategic sourcing in construction are balancing **cost with sustainability**, managing a **fragmented and volatile supply chain**, and overcoming **data, cultural, and technological barriers**.



Here's a **presentation-ready infographic** showing the main challenges of strategic sourcing in construction, with each one highlighted under a category (supply chain, sustainability, finance, etc.).

2.8. Theoretical framework

The fast-developing area of strategic sourcing within the construction industry is influenced by multiple theoretical traditional approaches. Through these frameworks, one is able to comprehend the major dynamics of sourcing practices, implications of sustainability and how the emerging technologies are defining the industry. The section in question is a critical review of the theoretical bases of strategic sourcing in construction that pays particular attention to the factors of sustainability, integration of technology, and the role of supplier relationships in the best procurement results.

2.8.1. Resource-based View (RBV)

Resource-Based View (RBV) theory forms one of the pinnacles in the category of strategic sourcing, which addresses the significance of internal resources as a contribution to the competitive advantage. According to this theory, the managing of resources within the firm in terms of the applicable human capital, materials and supplier relations leads firms into the attainment of better performance. In the context of the construction industry, RBV emphasizes the importance of sourcing decisions that align with the organization's strategic objectives, thereby improving project outcomes (Sami, Minhas, & Ahmad, 2024).

According to the RBV position of strategic sourcing, the concept does not simply focus on cost but also on the ability to manage the available resources, which include the availability of sustainable materials, availability of skilled labour and technologies.

The RBV approach highlights why construction companies should utilize their internal resources of coordinating suppliers, inventory level, and procurements. Well-developed sourcing strategies can increase the potential of firms to reduce the risks, minimize costs, and ensure project quality because they can rely on high-quality relationships with suppliers who have long-term relationships with the firm. Mwatha & Ndeto (2025) argue that another resource that is serving the firms in the construction industry well is the sustainability sourcing practices, through which it continues to be competitive in a market where environmental responsibility is becoming such an important issue. Incorporation of sustainability in strategic sourcing made by construction firms increases their resources base, which can be both the short-term outcomes of the projects and the competitiveness of the company in the end.

Conversely, companies that do not pay much attention to the strategic control of procurement resources have a low probability of fulfilling the requirements of the project, especially in complex and risky environments. In other words, construction companies that base their practices on cost reduction in the short term and, therefore, prefer to work with suppliers available but not very reliable long-term might damage their projects quality and their timely delivery (Matsoma & Ambe, 2024). Thus, the RBV approach proposes to emphasize the need to align the practices associated with sourcing with organizational objectives and make sure that sourcing decisions do not only lead to pruning costs but also contribute to quality, environmental sustainability, and sustainable establishment of value.

Resource-Based View (RBV) has also assumed that strategic sourcing decision shall be aimed at identifying non-mimicable resources that can give the firms sustained competitive advantages. In construction, this may include leveraging a firm's relationships with key suppliers who provide high-quality materials, skilled labor, and innovative technologies. Sami, Minhas, & Ahmad (2024) refer to the favorable position of construction companies that can successfully organize and use such crucial resources since this aspect allows increasing the efficiency of project performance and makes the business sustainable much longer. This tactical match up of the sourcing activities with the capabilities of the firm will guarantee that the procurement works towards both the short-term objectives such as cost cutting but also towards long-term strategic development.

Further, RBV brings emphasis on dynamic capabilities-that capacity of an organization to rebirth and restructure its resources in accord with the evolving market conditions. Within the business of construction, companies are forced to be flexible regarding sourcing practice, more so as the dynamics within the supply chain continues to change. As an example, companies that rapidly adjust to working with new and more sustainable building materials or actively integrate such innovative technologies as Building Information

Modeling (BIM) with their procurement procedure can distinguish them in a competitive environment (Mwatha & Ndeto, 2025). Companies that are unable to keep developing and evolving their resources and capabilities are at a higher risk of struggling to sustain the competitive advantage, especially operating in a very volatile and uncertain industry such as construction.

Lastly, the resources based on knowledge are also valued in RBV. The more developed the knowledge management system of the firm is, which allows the procurement team to have access to the history of supplier performance, market trends, and the project insights and so forth, the better decision is made. According to Sami et al., strategic sourcing with knowledge management enables firms not only to optimize the existing operations but also enables firms to prepare against the future challenges (2024). The value of such practices is particularly high in undertaking complex and large construction projects where several stakeholders are involved and regulatory requirements are dynamically changing. The failure to utilize knowledge by the firms might also fail to predict potential risks or find the appropriate suppliers to supply quality work that can support projects thus causing time delays and cost overruns.

2.8.2. Transaction Cost Economics (TCE)

Transaction Cost Economics (TCE) is another major theory that also has an impact on strategic sourcing in construction industry. TCE, as formulated by Coase (1937) and Williamson (1985), emphasizes on reducing the cost of the market-related transactions that incorporate costs associated with negotiating, monitoring and enforcing contracts. Within the scope of strategic sourcing, TCE underlines the significance of supplier relationships managing in a manner that ensures a minimal transaction cost alongside the maximization of value (Sami et al., 2024).

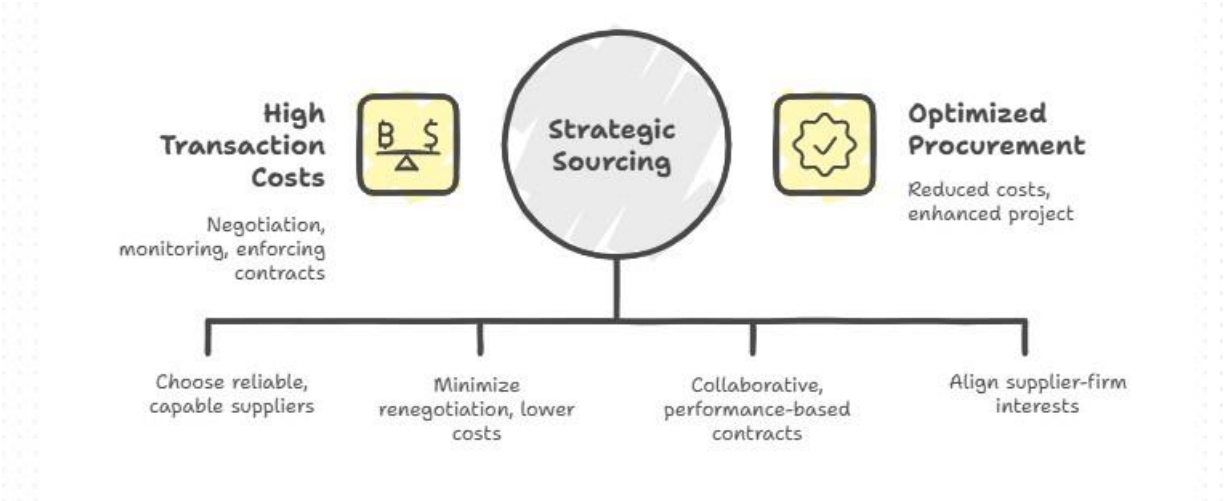


Figure 4 Strategic Sourcing Reduces Transaction Costs

In construction procurement, TCE takes into account the importance of a rigorous selection of suppliers that will be the basis of reliability, capacity and feasibility of satisfaction of requirements in the project in terms of both time and cost. Companies who engage in prolonged relationships with reliable suppliers are

able to minimize the high rate of renegotiation hence lowering the transaction costs of the procurement process. The question is, however, how to strike the right balance between market competition on the one side, and supplier collaboration on the other. According to Sami et al. (2024), construction companies whose main aim in terms of procurement is to minimize costs do not realize that a transactional approach in this sphere eventually leads to increased costs in the end due to poor quality, time overruns, and the need to repair.

As seen in construction procurement, the TCE use also highlights the significance of risk-sharing schemes between the suppliers of construction firms and the construction firms. With collaborative contracts and performance-based contracts, a business can cut down the expenses involved in monitoring supplier performance and making sure the both parties are on the same line in meeting the project objectives. This means that TCE gives an opportunity to interpret how strategic sourcing decisions may allow construction companies to optimize the procedures of procurement, minimize transaction costs, and enhance the general situation of the project.

According to Transaction Cost Economics (TCE), the transaction costs (i.e. negotiation costs, costs of monitoring, and costs of enforcing contracts) are a significant element in the procurement process. Particularly, in the context of construction, these costs tend to be very high and this is attributed to complexity of construction contracts, parties involved and time sensitivity of the projects. Sami et al. (2024) note that strategic sourcing assists in reducing these transaction costs by simplifying the procurement process, long term relationship, and performance-based contracts. With emphasis on bringing down the costs of contracting and monitoring, the construction companies can divert their efforts surrounding management of transactional relationships to developing strategic relationships with the suppliers and subcontractors.

Additionally, TCE also puts weight on the relevance of asset specificity in the sense that it is the distinctive investments involved by companies or suppliers, which diminishes the ability to be transferred effortlessly with no difficulty in diverting to other uses. The construction industry has suppliers with whom firms may make substantial investments in the relationship, training and technology, which makes switching suppliers expensive. Strategic sourcing comes in form of asset specificity investments that mitigate the risks of asset specificity as hinted by Sami et al. (2024). As an example, construction companies may invest into long-term relations with specialized suppliers who deliver high quality, custom materials and smaller likelihood that the company requires expensive renegotiation of the terms or switches supplier in the middle of the project emerges. It decreases exposure to supplier opportunism and increases supply chain stability.

Furthermore, TCE pledges the support of the governance structures that align the supplier-versus-flexibility in sourcing decision control. In the construction industry, this is possible when proper contracts are made with an incentive or penalty of performance. As Sami et al. (2024) write, such contracts develop mutual

cooperative relationships, as the interests of both sides are aligned. With such structures of governance construction firms are in a position of avoiding the risks of late deliveries, low quality and unexpected costs. In addition, performance based contracts instill a level of self-interest to suppliers to deliver on the quality side and perform on schedule, thus reducing the monitoring and enforcement expenses of the traditional procurement procedures. At the last, TCE-based strategic sourcing allows construction companies to develop more effective, dynamic and robust procurement systems.

2.8.3. Supply Chain Resilience Theory

The construction industry is one of the industries that have been affected by global events, such as the COVID-19 pandemic, necessitating greater focus on supply chain resilience theory, which has a major impact on strategic sourcing. The resilience theory stipulates the organizational capability to foresee, react against and recuperate competitive outbreaks in the supply chain, where continuity emerges quite well with minimum negative effects on projects results. Singh et al. (2024) note that construction companies that use resilient sourcing mechanisms are more prepared to deal with material supply disruption, shortages of workers, and geopolitical issues. Such measures involve supplier diversity, preparation of contingency plans, and the use of flexible procurement tactics that will be able to incorporate changing market factors.

Supply chain resilience is especially crucial in the construction sector considering that it is highly fragmented and complex. The large-scale construction projects usually have several suppliers, subcontractors and contractors to coordinate and guarantee the delivery of the required and timely materials and services. These fragmented supply chains may easily collapse in case of any disturbances like natural calamities or political uncertainties and cause delays and cost overruns. As such, construction companies need to spend money on the development of resilient supply chains by leveraging strategic sourcing practices, which focus on supplier diversification and coordination (Wayrah et al., 2021).

As one example, Kamau & Thogori (2023) emphasize that companies that are potentially subject to political instabilities or supply chain shocks can be advised to localize to counter the reliance on international chains that can be easily shocked by externalities. In a similar way, real-time information technology tools revealing the supplier performance and stocks can increase supply chain resilience by allowing companies to make timely decisions and be proactive to disruptive factors (Aziz, Kumar, & Khan, 2024).

The problem of providing supply chain resilience is also stimulated by the necessity to implement effective risk management strategies. Matsoma & Ambe (2024) contend that construction companies need to devise strong risk evaluation models that will help them detect any risk to the supply chain such as financial recovery, strikes by the workers, and transport jams. The incorporation of risk management in their strategic sourcing decision will make firms to experience minimum impact because of any disruption and they will be in a position to have their schedules and budgets on their projects.

Supply Chain Resilience has gained more prominence in the construction sector, especially during unforeseen eventualities such as the COVID-19 pandemic, natural calamities and insecurities. As it is widely pointed out by Singh et al. (2024), companies with well-established resilient strategic sourcing could accommodate such disruptions, without invalidating project schedules and quality. The resilient sourcing includes supplier diversity, having buffer stocks and building contingency plans so that even in crises there is continuity. This return to supply chain management can help companies stay nimble and able to adapt to shifts in the supply chain e.g. lack of materials or delays in transport thus minimizing the effects of any external disturbances.

In addition, risk management is an innate feature of establishing resilience in the construction supply chain. As proposed by Matsoma & Ambe (2024), companies should create risk assessment models of the comprehensive nature that allows defining the possible obstacles and deter-mining the susceptibility of the supply chain. When used alongside good risk management strategies, strategic sourcing enables construction firms to form contingency plans, which can be implemented, should there occur a disruption. An example is that construction companies in areas that are most likely to experience natural disasters may develop a relationship with a variety of suppliers to different geographic regions so that there are alternative sources when one of the supply chains has been disrupted. It is possible to design procurement decisions with an element of risk management able to give the companies a more robust and adaptable supply chain that could sustain external disturbances.

Lastly, resilience is facilitated by integrating technology within supply chain. The use of digital solutions, e.g., a real-time supply chain observatory or predictive analytics tools, allows construction companies to monitor material flows, anticipate any disturbances and proactively source materials. According to Aziz, Kumar, & Khan (2024), such technologies help to make supply chains more transparent, and the firms will leverage such safety to make decisions based on data that reduces the risk of supply chain disturbances. To use a demonstrative example, predictive analytics can help anticipate shortages or delays in supply so that the procurement teams can preprocess the situation by finding alternative materials or altering the plan of the project. Technology in strategic sourcing has not only improved the efficiency of supply chain but it also has increased its capability of recovery upon any kind of interference that might happen to the supply chain making construction projects to continue even in case of unexpected hitches.

2.9. Hypotheses

H1 - The adoption of green sourcing practices positively affects procurement success in construction projects.

H2 - The adoption of advanced technologies, such as AI and block chain, enhances procurement success in construction projects.

H3 - Strong supplier relationship management improves procurement success in construction projects by enhancing reliability and performance.

H4 - Effective risk management practices, such as supplier diversification and contingency planning, positively affect procurement success in construction projects.

H5 - Local sourcing strategies enhance procurement success by reducing supply chain disruptions and improving material availability.

H6 - The use of performance-based procurement practices leads to higher procurement success by ensuring better supplier performance and accountability.

Chapter 3 – Research Methodology

3.1. Research philosophy

Thomas (2021) defines philosophy in research to be the belief system that forms the basis of how knowledge can be viewed, proved, and established. It indicates the world perspective of the researcher and in effect influences the approaches adopted and the strategies that are embraced in the research. When conducting a research on a complex phenomenon like strategic sourcing in construction it is very important to choose the appropriate philosophical approach as this is important in framing the investigation, data analysis and making relevant findings.

The main approaches to research philosophy could be determined in four groups, such as positivism, interpretivism, critical realism, and pragmatism (Zawacki-Richter et al., 2020). These schools are distinguishable depending on how a person assumes reality (ontology) and the knowledge (epistemology). According to Snyder (2019), the choice of a research philosophy must be consistent with the aimed based on the research study when in a literature review where findings interpretation and synthesis are essential.

Here, the research point is to study the effect of strategic sourcing process in terms of cost, sustainability, and adaptation to technology in construction. Considering the very practical aspect of the subject and the inclination of the subject to real practical use the most appropriate philosophy to direct the research is the pragmatic.

Pragmatism looks at what is practical but not on following one philosophical school of thought exactly. It enables a researcher to make use of qualitative and quantitative study to effectively respond to research questions. According to the mentions of Thomas (2021), pragmatism is flexible, considering reality dynamic and constructed through numerous experiences and encounters. It can especially find use in construction sourcing since the selection of practices is susceptible to the changes in the economic situation, the expectations of stakeholders, and developing technologies.

According to Snyder (2019), there is often a pragmatic approach, which is suitable in research focusing on the derivation of actionable knowledge, particularly where there is a need to understand and change real-life issues. The strategic sourcing problems in the construction industry demand a combination of objective-driven and subjective-driven approaches to the identification of such issues as cost versus quality, cost versus sustainability, quality versus sustainability, etc.

This work would not only imply the analysis of the previously developed literature but also possible empirical contributions (interviews or case analysis) and therefore fits perfectly into the mixed-methods tradition of pragmatism. For example, the quantitative aspect analyzes the sourcing models, the ratio of cost-performance, and the usage of such technologies as AI or block chain. The qualitative aspect explains the perception of the stakeholders, procurement policies, and motivations on sustainability. Pragmatism

favors methodological pluralism, as it regards Zawacki-Richter et al. (2020), a crucial concept when faced with complex issues found in such a discipline as construction. Pragmatic approach adopted in the context of this research, in fact, brings the required versatility to consider both the systematic provider procurement frameworks and the subtle human elements, such as supplier relationships and the policy constraints that affect them.

To conclude, author chooses the pragmatism not because it is what is ideologically right but because it is practically flexible. It allows this research to immersive explore the powerful and inconsistent forces behind the development of strategic sourcing in construction, and thus facilitate creation of findings that are not only theoretically informed, but also practically useful.

3.2. Research approach

A research design presents the reasoning behind the development of a study initially to its conclusion. It is related to Babii (2020) assessment to how information is collected, analyzed, and applied to answer the research issue. Research approach depends primarily on the nature of a study, i.e. exploratory, explanatory or confirmatory. Research on construction problems encompasses various others such as cost-efficiency, supplier networks, and sustainability that are cascading involved; therefore, deciding on the correct method to apply helps assure the research objectives are rightly achieved with the methodological integrity.

There are three main types of approaches to reasoning that are identified by Ryder et al. (2020): inductive, deductive, and adductive ones. Each method offers an alternative route to knowledge and the choice of whether to apply which method can be made depending on the research problem, goals, and the kind of data being dealt with. Within the framework of this research on strategic sourcing in construction industry, it is proposed to prove that existing frameworks and theories are of value by evaluating the secondary materials and literature based on cases. This makes the deductive approach, the most appropriate.

Inductive method proceeds bottom-up that is observations are first made and then generalizations are made. This method is commonly employed in qualitative research and employed to come up with new theories through interpreting patterns and lived experiences as explained by Dodds and Hess (2020). An inductive research in construction sourcing may focus on collecting feedback, which is open-ended feedback of project managers and procurement teams in order to draw out common themes or strategies. Ryder et al. (2020) remark that induction suits well when the literature base is scarce or when the researchers plan to investigate new or situational phenomena. Nonetheless, as strategic sourcing is a widely studied realm that has definite models, the induction is not the route that is primarily going to be taken by this research.

The deductive style begins with proven theories and makes a course towards a certain or definite, testable result. According to Babii (2020), this technique is characterized by the fact that it entails developing hypotheses, which are premised on the previous knowledge and proceed to conduct the actual data

collection in a systematic way. The concepts of Total Cost of Ownership (TCO), the criteria by which suppliers are to be chosen, and the criteria used to measure the sustainability performance remain in the literature in the current study. This study will implement these frameworks through the analysis of a number of cases and implement its application in construction sourcing to verify and question their practicality.

Ryder et al. (2020) also note that deductive reasoning guarantees an objective approach, the organization of results, and generalizing the findings. It applies especially to the process of construction procurement where duplicable and proven tactics are vital in reducing cost overruns and supplier reliability. Hence, deduction provides the lucidity and commitment essential to Analyzing whether the present sourcing practices are successful towards meeting the targets of project performance.

Adductive method combines the elements of deduction and induction. It commences with shocking observations and attempts to find the most optimal response through progressive theory of data analysis (Dodds & Hess, 2020). Although comprehensive in its application to scenarios that are complex or ambiguous, it is inappropriate in this study given its nature is specific and involves testing of existing constructs, and not generating new ones.

Hence, the deductive approach aligns most closely with the study's objectives—to analyze and validate existing strategic sourcing frameworks in construction. It gives a systematic path based on hypothesis to achieve practical understanding based on empirical and industry oriented analysis and insights.

3.3. Research strategy

A research strategy is the overall roadmap that ties the research goals with research methodologies of data collection and analysis. According to Dzwigol (2022), a well-structured research strategy not only ensures alignment between research questions and data-gathering techniques but also strengthens the study's reliability and relevance. The strategy is to be consistent with the philosophical position of the researcher and identify the order of data collection and analysis.

As Mahuika and Mahuika (2020) explain, strategy is not a purely technical million, although it is reflective. It combines both theoretical awareness, practice, and informs how knowledge is developed, justified, and executed. Within the study examining international business or the project-based scenario such as construction work, Delios et al. (2023) focus on the value of a flexible, context-specific, and able-to-track dynamic change strategy.

In the case of a study that aims to investigate strategic sourcing in the construction industry, the research strategy needs to be based on validating current frameworks, investigating implementation challenges, and determining quantifiable output. The most suitable strategy in this regard is the quantitative strategy, taking as it does into account possible structured, statistically viable exploration of relations between sourcing practices and performance outcomes.

The quantitative approach is based on using the gathered and processed numerical evidence in detecting patterns, correlations, and causal associations. According to Dzwigol (2022), this method is specifically helpful in management sciences where the empirical confirmation of the frameworks is essential. The quantitative strategy helps in hypotheses testing and generalization through strategies such as systematic surveys or databased case analysis.

Standardized data will also be employed in this research paper to determine the effects of certain sourcing activities through the application of supplier assessment, cost control mechanisms, and sustainability requirements as they influence the efficiency of the projects. These relationships will be analyzed with the help of statistical tools to abstract the findings that can be applied in the construction industry and be generalized.

Although the qualitative research approach proves useful when investigating lived experience and detailed perspectives, it is not as appropriate with regard to the purposes of the study. Qualitative strategies are also popular in the context of the culturally grounded research in which voice, meaning, and context take center stage, as Mahuika and Mahuika (2020) point out. Although this kind of procedure would provide subtle insight into motivation of stakeholders or sourcing cultural issues, the present study is more inclined to analyze structured data and test theoretical models that already exist.

The mixed method approach integrates both the qualitative and quantitative approaches. Delios et al. (2023) assure its value in international or cross-disciplinary studies when each perspective increases validity. Albeit being deep and broad, this strategy requires more time and resources and, therefore, is a more appropriate study in the case of broader or exploratory objectives. This study, therefore, uses a quantitative research approach to determine the effectiveness and consequences associated with the activities of strategic sourcing in the construction industry. The technology can be empirically tested along such notions as cost effectiveness, technological integration, and supplier cooperation. The application of this strategy will make the findings data-driven, scalable and of value to both scholars and the industry.

3.4. Data collection

Data collection can be defined as a process of collecting information that is concerned with answering research questions and achieving come objectives of the research. According to the definition provided by Zhou, Li, and Sun (2022), the set of data collection methods should be in line with the characteristics of a research and its objectives, as well as guarantee accurate and replicable results. Greening (2019) points out the power of any research is in genuineness and reliability of data gathered during the investigation. Of particular importance in social sciences and applied management studies, the soundness of the findings is directly proportional to the attention paid to the process of data collection and analysis.

The data collection plan of this research on strategic sourcing in the construction sector will produce specific, current and sorted data on procurement, the use of technology, or supplier selection processes. The method is selected based on the availability of resources as well as the scope of the study and the nature of the kind of data necessary to prove the viability of current theories and frames. Primary and secondary sources of data are used to develop a systematic outlook of the topic.

Primary data enables the investigator collect first hand, new information that suits the research issue. Budianto (2020) states that such data is highly specific and relevant, which results in hypothesis testing in a more specific way. Within the framework of the study, primary construct is obtained based on structured questionnaires addressed to the procurement professionals, project managers and supply chain specialists in the context of the construction industry.

The survey will incorporate a combination of closed-ended and Likert-type questions that would help quantify (among other things) the cost-management strategies, supplier performance measures, and sustainability concerns. The Internet-based instruments (such as Google Forms), are employed to guarantee being able to collect data efficiently, keep the respondents anonymous, and have no errors in compiling the answers. This method has the advantage that, not only is it suitable to large-scale work at different locations, but also allows statistically validation of theoretical models.

The approach is highly resource consuming when it comes to designing and distributing it, but it allows exploring the concept of sourcing choices and project results narrowly. To ensure data quality, the provision is made to reduce bias of the first forms of giving answers and make question framing clear. This conforms to the opinion described by Budianto (2020) that the thing that makes a primary data collection effective is careful design and ethical practice.

The availability of secondary data helps to enhance the study with the contextual depth and provides opportunity to compare. According to Greening (2019), by reusing the data that have been already made available or the records of institutions, the researchers can confirm major findings and increase the richness of interpretation of their work. Secondary data used in this mixed methodology study will consist of industry reports, procurement policy reports, journal articles and case studies in construction projects.

The sources assist the framing of the study in the context of current theoretical and practical horizons providing a set of benchmarks by which the efficiency of sourcing strategies can be evaluated. The example of such primary data is the existing KPIs on the supplier reliability or cost-efficiency ratios. Nevertheless, it is important to question the origin and validity of secondary sources to avoid an incorrect understanding or distortion of data, perhaps leading to Zhou et al. (2022) stating that it is quite crucial. Hence, this study gets the best of both worlds by integrating the benefits of both primary and secondary data by taking

preference over credible sources of information to give this work depth as well as credibility that sources substantial information on the setup of the current strategic sourcing practices in the construction sector.

3.5. Data collection tools

The concrete instruments providing researchers with necessary information and insights on the targeted participants are considered as data collection tools. Mishra and Alok (2022) note that the validity, reliability, and credibility of the research depend greatly on the appropriateness and design of the tools used in the data collection. Such research tools as surveys, interviewing, or observations allow narrowing the gap between theoretical assumptions and actual answers. The end goal will be to get quality data that can be analyzed effectively and may lead to evidence-based conclusions.

As Pandey and Pandey (2021) note, the choice of tools will depend on the purposes of the research, the type of research, the nature of data needed and the nature of the target audience. In this study of strategic sourcing in the construction industry where organized responses and quantifiable trends are critical; the survey questionnaire would be the most important tool in this research. It facilitates the methodical gathering of information on procurement procedures, supplier selection, cost cutting measures and sustainability during sourcing.

Observation is a systematic manner of watching and making or writing down behaviors, processes, or events during a natural or controlled environment. Although it provides a direct access to the real-life phenomena, its application is usually more conciliatory with the qualitative inquiries. According to Newman and Gough (2020), observation is viable with time-consuming contextual information, but the lack of consistency and scalability makes it unviable in a study based on generalizable quantitative information. Observation is not the main tool in the case of this study because of the persistence of structured data procurement among professionals associated with diverse construction projects.

In interviews, the researcher and the respondent can meet in person or virtually, and this method provides the researchers with detailed insights into personal views. Interviews may be either structured, semi-structured or even unstructured based on the objective of the result (Pandey & Pandey, 2021). Although interviews present flexibility and richness in the data, they are better suited to conduct exploratory studies or qualitative studies. Interviews were not ruled out in this study in that they were used (when possible) but they were not of priority because the aim is to gather standardized, quantifiable information of additional sample size through structured survey.

A survey is a standardized mechanism that consists of a series of fixed questions that are given out to a target group aiming to obtain data about a large sample population (Mishra & Alok, 2022). An online questionnaire will be used as the most acceptable method of collecting data in this case. The survey consists of several parts, each of which is dedicated to the major variables of the study: the procurement strategies,

criteria to evaluate suppliers, the utilization of the digital tools in sourcing, and the perceived challenges of the construction supply chains.

All survey questions are designed using a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree." Such a structure assists to quantify opinions, detect trends, and use statistical analysis methods. Contents in the tool are crosschecked with the recent literature in strategic sourcing in order to make it in tandem with the reality in the industry. It will be published on professional forums, email, and the networks of the construction industry. In summary, the survey is the most suitable data collection tool for this research due to its scalability, objectivity, and alignment with the study's quantitative approach. It allows the researcher to gather standardized, analyzable data among professionals of the building industry.

3.6. Population and sample size

When dealing with academic research, the population is the complete range of entities who have similar indicators that are on the evident side of the undertaking. According to Snyder (2019), this population represents the full frame against which the researcher can select appropriate subjects in order to derive a meaningful conclusion. The number of subjects in this larger population is most commonly represented by the symbol N, which includes people, institutions, or other unit of measurement that is being explored based on the purpose of research. Nevertheless, the study of the entire population is usually unrealistic because of time, monetary, or availability limits, and, consequently, a sample of the data is chosen.

A sample is a manageably small part of the population, which is used to get the entire picture. Thomas (2021) argues that sampling should help create generally applicable and valid results by using as few resources as possible. Sample size presented as n is important in terms of reliability and statistical significance of the results. Since a suitable sample size depends on the size of the population, an acceptable level of confidence, margin of error, and potential response variability, as highlighted by Zawacki-Richter et al. (2020), the calculation requires taking into consideration 4 factors.

The target population of this research is composed of procurement officers, supply chain mangers, project coordinators, and executives high up in the food chain of construction companies of medium or large size who work anywhere in the UK. These specialists are first hand to the complexities and the challenges that strategic sourcing brings which are supplier management, cost optimization, adherence to sustainability and integration of technology in procurement practices. The population is established by how they are practically involved in the process of sourcing and the chances of providing first hand understandings in making strategic decision in the construction industry.

This is due to the scope of the construction industry and the multi-level sourcing they undergo, thus 150 respondents were identified. The figure was chosen in such a way that there was a balance between representativeness and feasibility. It enables a strong descriptive and inferential statistical analysis, which

is necessary to determine the trends, test the hypotheses, and make findings based on the research aims. Any statistical power requirements are also met by the sample size, that is, the patterns that are apparent will not be because of the role of chance.

The controversy will involve a purposive sampling method where participants will be chosen based on their ability to meet structural criteria, i.e., strategic decision-making authority on sourcing or on-ground experience with sourcing. The approach will see that the sample is generally comprised of informed practitioners who may be able to provide relevant and proper answers.

Responses will be solicited across different kinds of construction organizations (general contractors, experts in infrastructures among others) within the private and the public sector, in order to achieve diversity and minimize the influence of sampling bias. This diversity makes the research externally more valid, in that, the findings can be used in a broader scale of the industry. Hence, this study's population and sampling framework are designed to capture meaningful, data-driven insights into strategic sourcing practices in construction. The reliability, generalizability, as well as the action ability value of research findings are supported by the sample size of 150 that was selected using methodological rigor.

3.7 Sampling Method

Sampling techniques play a critical role in informing the direction by which study participants are chosen out of a given population as part of a research. Ryder et al. (2020), argue that sampling strategies are essential to the development of credible, transferable, and contextually meaningful findings when the subject matter to be studied is complex like the cybersecurity domain of emerging technologies. The application of the right sampling strategy guides the validity as well as generalizability of the results in quantitative research. Although total population researches would be the best, time or access issues, as well as lack of resources, may create a situation requiring sampling. When possible, it should be noted that a good sample ensures the uncovered insights are an accurate representation of the general population despite only a few people being studied (Babii, 2020).

There are two major classification of sampling techniques based on probability and non-probability sampling. Probability sampling gives every member of the population a defined probability of selection, which is equal. This improves the objectivity and statistical validity of results. Conversely, non-probability involves a selection of participants based on convenience or judgment and can be more convenient in exploratory or resource-poor environments (Dodds & Hess, 2020). Probability sampling is usually used in studies that examine technical issues such as cybersecurity where precision and objectivity are very important.

There is the use of probability sampling methods to attain a representative sample of a population. This strategic will result in reduced selection bias appreciating statistical generalization as explained by Babii

(2020). The usual probability techniques are simple random sampling, systematic sampling, cluster sampling, and stratified random sampling. Most notable among these is stratified sampling, which comes in handy when researching an insight into various subgroups. A method involves stratification of the population into different categories and selecting the random samples of each stratum. This will provide good representation, and the researchers will be able to compare subgroups with confidence.

Stratified random sampling will also be produced in this study to create a fair view of cybersecurity professionals operating in different areas of emergent technology- including finance, healthcare, public administration, and manufacturing. These levels are sensitive since all of them might have varied cyber threats or risk management techniques. This technique will enable the study to ensure that every group proportionately contributes to the result, which will minimize bias and enhance reliability.

Non-probability sampling although not applied in this study is still commendable to mention. These are purposive sampling, convenience sampling, quota sampling and snowball sampling. According to Dodds and Hess (2020), non-probability methods are valuable in the conditions when it is impossible to contact all the population members, including in scenarios when the crisis, e.g., the COVID-19 outbreak, takes place. They can also be useful during exploratory research or in researching inaccessible population. Nevertheless, the major weakness is the higher level of bias and low power to generalize findings. To sum up, since the study aims to gather credible and statistically meaningful information concerning the risks of cybersecurity in emerging technologies, stratified random sampling would offer the best theoretical framework. This process allows the representation of all the segments of the population well, resulting in more reliable, generalizable, meaningful results.

3.8 Description of Participants of the Study

The sample population in this study will include those directly engaged in procurement, supply chain management and strategic sourcing in the enterprise concerning the construction sector. In particular, it is expected that procurement managers, sourcing strategists, project engineers, sustainability officers, and supply chain consultants will fall under the target group. To guarantee the credibility of data, it is mandatory to have, at least, three years of experience, related to the area of construction procurement, with a preference to work on medium- to large-scale projects introducing digital tools, sustainability goals, or coordination of multi-vendor activity.

The participants will be attracted to different corners of the construction ecosystem including public infrastructure, commercial real estate, residential developments, and green building efforts. The variability of professional functions and subsectors in the industry will also aid the research capture an all-encompassing perspective of sourcing organizational practices, supplier assessment approach and how new technologies like AI and block chain can be integrated. This concurs with what Dzwigol (2022) was in fact

talking about when he advocated on the advantages of triangulating perspectives in supporting the management science study.

Professionals of developed and developing economies will be incorporated as a sample to reflect regional and contextual difference in sourcing practice. The insights of comparative countries will be drawn based on countries in which global supply chain prevails (e.g., UK, UAE) and preference towards local or hybrid sourcing (e.g., India, Pakistan). This will enable the research to be dynamic and responsive to the dynamic nature of the strategic sourcing in various procurement contexts.

The job advertisement shall be done using the industry associations, procurement and engineering networks, LinkedIn groups, and professional conferences like Construct Expo and Supply chain Asia. The participants with experience in projects involving integration of sustainability metrics, risk management, or digital procurement tools will be prioritized as they meet the objectives of the study and its emerging trends (Delios et al., 2023). Diversity will be actively guarded on demographic aspects such as age, gender, educational level, and geographical area. This will promote the validity of cross-sector comparisons, and inclusion of SME professional and large multinational construction firms will further improve the job. This intentional sampling will allow the study to obtain the organizational, cultural, and technological variables (the impact on sourcing decisions).

Strict adherence of ethical research procedures will be applied. All participants will be informed of the study's aim and procedures and will be asked to provide written consent before participating. The participation will be voluntary, and one will be able to withdraw at any given point. It will be confidential and during data analysis and reporting, it will be anonymized. Given the study's mixed-method approach, both qualitative insights and quantitative data from this participant pool will be critical. Qualitative interviews will be used to give depth to the interviews whereas focused questionnaires will be used to give the interviews broader generalizability. This conforms to what Mahuika and Mahuika (2020) recommend regarding the concepts of culturally grounded and participatory research practice, including context, voice, and rigor of the method. In haul, it is hoped that the chosen participants will be able to provide context-sensitive and well-rounded knowledge concerning how the strategies in sourcing in the construction industry are reshaping in line with the bombardment of technological, environmental and operations-related pressures- contributing directly to the evolution of more sustainable and digitally resilient procurement landscape in the construction industry.

3.9. Research tool and development

A standardized structured questionnaire was designed to study the strategic sourcing practice in construction industry. The tool specifically targets procurement managers, supply chain practitioners and sourcing strategists who are involved in actual preparation and implementation of construction projects.

The main goal of such a tool is to derive measurable information on the perception and practice of strategic sourcing in such areas as selecting suppliers, integrating sustainability, cost reduction, and risk management by these professionals.

The questionnaire has closed questions, which were designed in the form of the 5-point Likert scale (one strongly disagree to five strongly agree). This framework will enable gathering of quantifiable data to document how the respondents show variations in the degree in which they hold on to key sourcing strategies. Likert scale is chosen because it reveals subtle differences between the answers to the research questions but does not imply an equal distance between the scale values, which aligns with Greening (2019) claim that flexibility can serve as the method in phenomenological and applied research design.

The questions have been meticulously formulated through the literature review and the existing strategies of sourcing. Some of the major areas to consider are sourcing policies, utilization of digital procurement functions, and the management of suppliers, sustainability level, and flexibility towards external disturbances (like geopolitical or supply chain emergencies). The tool was refined, and its validity, clarity, and relevance was spread out, incorporating the initial input of procurement and project construction management subject matter experts.

The questionnaire would then be pilot tested by selecting 10 professionals to test the questionnaire before its full-scale deployment by people working in local or multinational construction firms. This pilot phase was necessary to clarify questions, reduce uncertainties, and stop any cultural or situational inappropriateness- something that would reflect the best practices as highlighted by Mishra and Alok (2022). Minor wording changes were made based on responses of pilots and two items, which were redundant, were eliminated in the interest of efficiency of responses.

All the participants will be informed of the purpose of the study and consent as a form of ethically acceptable research standards. They will be free to respond, and their data will be anonymized to analyze. This survey will be distributed electronically using Google Forms so that participants in distant locations could take part and facilitate ease of gathering data. This approach supports Zhou et al.'s (2022) recommendation to leverage digital methodologies for scalable, efficient data gathering in applied social science research.

The main blocks of the tool can be divided into the following categories: (1) Sourcing strategy at the organization level, (2) Digital procurement technologies utilization, (3) Collaboration with suppliers, and supplier evaluation, (4) Management of risk and compliance, (5) Sustainability integration. Each section includes 5–8 statements that probe the degree to which strategic sourcing principles are applied within the respondent's firm.

This quantitative survey instrument forms part of the study design and will be used to help generate statistical analysis in order to investigate trends, associations, and limitations of strategic sourcing activities in the construction industry. Its utility shows in the context heuristically approached by Budianto (2020), who identifies the necessity of the precision of the methodology, its replicability, and sensitivity to changes in the levels of industrial setting in the creation of social sciences research instruments.

3.10. Data analysis

Data analysis can be defined as a process of arranging, coding, and interpreting data to derive information or insights into such data. According to Pandey and Pandey (2021), the process assists in the conversion of unprocessed answers into usable data that can be used to advance the goals of the study. There exist various forms of analysis based on research questions, data and methodological framework, which include thematic, content, statistical, narrative analysis. Newman and Gough (2020) note that the specific type of data that is used, whether qualitative or quantitative, can usually be the factor that determines the most suitable types of analysis to use. The key target of data analysis is to reveal the changes and connections in the dataset, and as a result, secure conclusions that can characterize the tendencies of the sphere of strategic sourcing in the construction industry.

A common qualitative research method is the thematic analysis where similar concepts or themes are identified in the data. The process is iterative and is comprised of the following steps a data familiarization, b initial coding, c theme development and d, final interpretation. This analysis would involve the scrutiny of interview answers obtained by procurement experts concerning the rise of themes concerning significant strategic sourcing issues and solutions. This method allows researchers to map the participants' perceptions of issues such as supplier risk, sustainability integration, and the use of digital tools. According to Pandey and Pandey (2021), thematic analysis helps add the richness and depth that enables one to better understand narratives of stakeholders in the context of sourcing models.

Textual data collected as the questionnaires open-ended responses, any other article of documentation as if the procurement guidelines or reports on the sourcing strategy will be content-analyzed in a systematic way. This approach will enable periodic phrases, terms or recurring patterns that indicate principles or limitation of strategic sourcing to be labeled. Content analysis enables one to organize a large amount of qualitative information in an orderly manner by combining all responses into pre-determined or emerging categories. Newman and Gough (2020) claim that content analysis would assist in producing frequencies and patterns that would supplement the information provided by themes and eliminate the dichotomy between qualitative detail and quantitative results.

The survey will be using quantitative data, which will be compiled into the IBM SPSS statistics software. Data cleaning will be used to start the analysis in terms of missing values, outliers, and assumptions of

normality. Demographic characteristics will be provided using descriptive statistics (means, standard deviations, frequencies) and differences and similarities in general sourcing practices will be pointed out. As a way of determining the relationships between the variables, Pearson correlation will be employed e.g. to determine the relationship between supplier evaluation practices and sustainability goals. The multiple regression analysis will be used in determining the predictors of the efficiency in sourcing efforts whereby model summary will denote the explained proportion, ANOVA will be used to quantify the general importance, and coefficients will be used to calculate the impact of each independent variable. These test debate instruments enable objective confirmation of hypothesis of the research work.

Qualitative findings will be complemented by narrative analysis, which will interpret the story or cases specific examples given by the participants in interviews. The approach is oriented towards local settings and practices of the professionals that face sourcing challenges. It can give one the details, which statistical methods can lose. Narrative analysis, as Newman and Gough (2020) mention, allows researchers to approximate the complexity and subjectivity behind the organizational practices, at least in the cases where issues tackled require a subjective approach, like in the cases of supplier trust or internal procurement reforms.

3.11. Ethical considerations

The concept of ethics in research is the guidelines and accepted norms of professional conduct in terms of gathering, computation, analysis and sharing data. An ethical research, as Snyder (2019) clarifies, is not a set of rules at all: it should be simply knowledge generated responsibly, transparently and with dignity. The ethics involved are vital in upholding integrity of the study and in safeguarding the dignity and the right of the participants involved. Thomas (2021) outlines that ethical research should also address the way the researcher works around power dynamics, expectations of participants, and honest reporting and truthful revelations without harming anyone.

Ethics is of special importance in the case of this research on strategic sourcing in the construction business because of the participation of working professionals, and due to data sensitive to organizations being gathered. The confidentiality, informed involvement, and respecting professional limits is needed to ensure that trust is created and credible outcomes can be obtained. Zawacki-Richter et al. (2020) state that the data reliability and the ability to contribute to the scholarly field are based on transparency and ethical adherence in systematic research.

Before any data will be collected, every participant will be informed to sign a consent form. This document will clearly explain the study's objectives, the purpose of their involvement, potential risks, and the rights of the participants, including their right to withdraw at any time. Thomas (2021) states that an informed consent demonstrates the respect of the individual autonomy and voluntary participation. The form will be

signed by the participants to acknowledge that they understood the terms under which the research will take place and they are satisfied with them. There will not be any shady situations and other intentions of the research or the use of the data collected will not be hidden.

They have used anonymity and confidentiality to ensure that identities of the participants and proprietary information of the construction firms is maintained. The information obtained will be anonymized prior to being analyzed and no personally identifiable data will be published in any publication or presentation of information. As Snyder (2019) emphasizes, confidentiality promotes honesty and free answers to the questions given to them. All digitalized files, transcripts, and records will be encrypted to devices that the researcher will have exclusive access and hard copies will be stored in locked storage. The study will abide by laws on data protection to the totality.

Along with different stages in the study, participants will be updated on the progress especially after collecting data and in the analysis process. It shall provide each participant an opportunity in getting a synopsis of the findings or a copy of the responses they gave in order to determine accuracy of their contribution. This helps in transparency and correction or clarification should be done in case of need. As one of the best practices of inclusive and participant-centered research, Zawacki-Richter et al. (2020) suggest the process of feedback loops.

Participants will all be handled fairly, with dignity, and respect irrespective of the profession, gender, background, and varying affiliations to different organizations. The researcher will make the participants feel heard and appreciated during the research. As Thomas (2021) states, ethical research implies consideration of individual viewpoints and fair treatment of various participants. Every opinion shared will be considered seriously, reflected respectfully in the study's analysis, and reporting.

Chapter 4 – Results and findings

4.1. Respondents' demographics

Demographic Profile of Respondents

Table 6 Demographics

Category	Frequency (n)	Percentage (%)
Age		
18-25	35	23.3%
26-35	50	33.3%
36-45	40	26.7%
46-55	15	10%
56+	10	6.7%
Gender		
Male	90	60%

Female	55	36.7%
Other	5	3.3%
Education Level		
High School	20	13.3%
Bachelor's Degree	80	53.3%
Master's Degree	40	26.7%
Doctoral Degree	10	6.7%
Working Experience		
1-5 years	40	26.7%
6-10 years	60	40%
11-15 years	30	20%
16+ years	20	13.3%

Age:

Age is one of the demographic variables that may assist in the comprehension of generational distribution of the respondents. The range of distribution in this survey is indicated as the younger (18-25) to the older people (56+). Respondents aged 18-25 (23.3 percent) may most likely be either students or young professionals in the early years of their careers and have different views than older ones. The most significant proportion of the workforce, 26-35, which is 33.3%, comprises adults who have already begun to establish themselves in their profession and those belonging to the middle age group and this group is therefore considered a very important age group. The 36-45 age bracket, representing 26.7 per cent typically comprises individuals with substantial work experience mostly in middle-level management or in specialized jobs. The experienced professional within management usually takes up the 46-55 (10%) age group and the 56+ (6.7%) age group may indicate them close to retirement with senior or advisory roles to play. Age distribution can serve to provide good ideas about the maturity of the labor work force and the multiplicity of viewpoints that various age classes would introduce into the mix.

Gender:

Gender is the category by which the gender ratio in respondents will be reported. The survey also indicates that in the present case, there is a male preponderance where 60 per cent of the respondents are male. This implies that the profession or industry that one examines can be male-dominated like most professions like construction, engineering or IT. The proportion of the female respondents (36.7%) is quite a large minority that can positively reflect the attempts to employ the opinion of different sexes in the industry, even though gender imbalance remains even in certain aspects. The remaining 3.3% identified as "Other," which reflects the inclusion of non-binary or genderqueer individuals, highlighting the increasing awareness and recognition of gender diversity in the workplace. Gender distribution is significant to get insights into the possibility of variations in experiences, challenges, and perceptions between the directions of men, women, and non-binary individuals, particularly with industries where gender disparity might be more apparent.

Education Level:

The Education Level category shows the highest level of education, which the respondents have attained. The largest group, making up 53.3%, holds a Bachelor's Degree, which is typical of individuals who have completed their undergraduate studies and entered the workforce. This cohort tends to be knowledgeable in the fundamentals of the disciplines they have chosen and thus they are a good source of strength in both knowledge and competency. The 26.7 percent of the Master’s Degree can be seen as a reflection of those who further specialized in their careers through advancing their education and these are usually in areas that they have more in depth needs or management responsibilities. The High School category comprising of 13.3% are those who have a secondary level of education hence could be in entry-level careers or could be seeking further training. Lastly, an even smaller proportion with Doctoral Degree, 6.7% of respondents are the most highly educated ones, and usually to be seen in an academic or specialized professional occupation, where expertise and research is a key element. In the analysis of education level distribution, it is possible to see the kind of qualifications that the workforce has, and the variation available in the nature of the knowledge and skills found in the group.

Working Experience:

Working Experience type indicates how long the respondents have been in their careers. The group of 1-5 years of experience (26.7%) is probably shape by younger or those still establishing themselves in their careers. They might have lower levels of expertise and leadership skills still but prove to be more flexible and willing to learn. The 6-10 years group (40%) is in the middle of their careers, where they have been able to acquire sound experience, and are usually in leadership roles where they are known to be in influential positions providing market knowledge on industry trends and practices. A group of professionals aged 11-15 years (20 percent) contains rather experienced professionals experienced in their work with high qualifications and often holding managerial or high-level positions, who have more experience in understanding industry problems and addressing strategies. Finally, the remaining group 16+ years (13.3%) is more experienced and tends to take roles of an executive or senior advisor. These people are the most experienced and have seen significant changes in the industry and their opinions are therefore of special value to the long-term strategic planning of the industry. The working experience distribution is vital in explaining the relation of new thinking and set-in expertise that makes decision-making and organizational culture.

4.2. Descriptive Statistics

Table 7 Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Green Sourcing	150	1.00	4.00	1.6356	.77175
Advanced Technologies	150	1.00	3.00	1.6044	.61353
SupplierRelationshipManagement	150	1.00	4.00	1.6289	.65713
Risk Management	150	1.00	3.00	1.5600	.51135
Local Sourcing	150	1.00	4.00	1.6311	.69315
Performance	150	1.00	3.33	1.4689	.58962
Procurement Success	150	1.00	4.00	1.5156	.66844
Valid N (listwise)	150				

The Descriptive Statistics table shows the frequency and distribution of answers to various variables that play a pivotal role in the study of strategic sourcing in the construction industry. The variables will be drafted with the aim of capturing the most important practices such as green sourcing, supplier relationship management, risk management, the application of innovative technologies, local sourcing, performance outcomes and procurement success. The table listed below is further explained in details that give insight into the way these aspects are perceived and applied within the construction industry.

Green Sourcing

The Green Sourcing variable refers to how much environmentally friendly processes are included in buying procedures. The least value of 1.00 indicates that it is not at all prioritized and implemented in green sourcing by some of the respondents in their procurement strategies. Conversely, the highest score of 4.00 indicates that there are limited answers that consider the green sourcing as a very important and highly emphasized feature of their activities. The overall perception of the green sourcing is slightly weak at a mean of 1.6356. The respondents mostly consider it as one of the areas of concern that they need to improve in and the construction industry may not be incorporating sustainability procurement fully into its supply chain. The standard deviation = 0.77175 indicates that the responses were in some difference and most of the respondents might prefer a low score and some of them might believe in the significance of green sourcing showing different levels of commitment towards the aspect of sustainability within firms. This signals a desire to have more homogenous and pervasive green practices among industry players.

Advanced Technologies

The variable on Advanced Technologies gauges how emerging technologies such as AI, machine learning, digital procurement platforms are being incorporated in the sourcing practices. On a scale of 1-5 with a minimum score of 1.00, it is apparent that there are respondents who feel that the construction sector is not matching up in pursuing advanced technological tools in doing procurement. The highest score of 3.00 implies that although certain respondents recognize the value of technology, a smaller number of them view it as a powerful and widely adopted characteristic of sourcing strategies. The mean of 1.6044 that is low on the scale indicates that there is individual knowledge of advanced technologies but they are not practiced extensively in procurement. The high level of standard deviation of 0.61353 shows that the integrating in technology got slightly different responses with some of the respondents giving it a higher rating than others do. This implies that even though technology adoption is being examined, it is not yet at the advanced stage of the industry. As the construction industry goes digital, the industry practice needs to change in its dependency on conventional practices and aim at enjoying the efficiency, visibility and accuracy, which digital technologies can derive.

Supplier Relations Management

The Supplier Relationship Management (SRM) variable measures the effectiveness of the relationship management process construction firms have with their suppliers and how the said relationship can be used to achieve procurement success. The lowest score of 1.00 implies that there are respondents who do not think that management of the supplier relationships is a priority and the highest score of 4.00 indicates that respondents who think SRM is important to their purchasing strategy. The average of the scores obtained was 1.6289, which means that respondents believe that supplier relationship management is important, but it is insufficient in the industry. The standard deviation of 0.65713 indicates a moderate level of variance in the responses thus some of the construction firms are having strong strategic relationships with the suppliers whereas others may see their relationships between the suppliers as being transactional and lacking into the overall strategic plans of the business. This implies that even though SRM has been recognized as a necessity many companies have yet to utilize these connections to the maximum. A stronger focus on long-term and more cooperative supplier relationships has the potential of improving the outcomes of projects and increasing efficiency in procurement.

Risk Management

Risk Management variable will gauge the extent to which construction firms will take risks mitigation strategies in its sourcing and procurement practices. Some respondents appear not to be making a key issue of risk management as part of their procurement strategies as required with a minimum score of 1.00 whereas a score of 3.00 indicates an acknowledgment of risk management albeit not on a high implementation scale. The average of 1.5600 indicates that the respondents do not place great importance on risk management and not as vital as the other positions involved with procurement. The standard

deviation of 0.51135 shows there is a relatively low variation in responses indicating that the majority of respondents share similar perspectives on the role of risk management, which appears to not be deeply ingrained in the practice of procurement work in the industry. This illustrates the importance of having more proactive and elaborate risk management models, especially in light of the unpredictability of global supply chains, and the rising intricacy of construction projects.

Local Sourcing

The Local Sourcing variable is a measurement of how much construction companies use the local suppliers to procure their sourcing needs. A threshold of 1.00 means that there are people not recognizing the importance of local sourcing, whereas the top score of 4.00 implies that there are other people who contemplate it highly important. The overall average of 1.6311 implies that, despite the recognitions, the local sourcing is not a strong characteristic feature of procurement strategies among the majority of the construction companies. The standard deviation value of 0.69315 indicates a medium degree to which the responses may vary and some firms may emphasize local sourcing of materials to cut down expenses on logistics and enhance more resilient supply chains whereas some companies may opt to supply on a global scale due to cost factors. The low mean shows that the construction industry is potentially still too dependent on the global sourcing, despite the possible advantages of sources originating locally e.g. the shorter lead-time, reduction of transportation fees, and ability to control sustainability and quality.

Performance

The Performance variable will quantify the extent to which the strategic sourcing practices are perceived to contribute to the overall success of construction projects in cost efficient, time and quality aspects. Minimum score of 1.00 is reached as some respondents feel that their sourcing practices are poor, and the maximum score of 3.33 is that some have felt that there is a moderate level of performance to how they perform in sourcing practices. A mean score of 1.4689 indicates that the respondents on average regard the performance of their sourcing practices as suboptimal. This shows that there could be severe wastage, or weaknesses in the current manner of administering construction industry procurement. The standard deviation of 0.58962 means that there is moderate variation in response with some respondents reporting good performance levels and others reporting lack of procurement efficiencies. This emphasizes the necessity in strategic sourcing practices enhancements in order to contribute to more favorable project results.

Procurement Success

The Procurement Success variable is a measure of the success of the respondents in terms of the procurement strategies to meet the expectations in cost, quality, and timely delivery of construction projects. A score of 1.00 or lower indicates that some of the respondents believe that their procurement is failing or

ineffective. The highest score of 4.00 demonstrates that other people perceive their procurement strategies to be very successful. The average score of 1.5156 means that the overall satisfaction about the success of the procurement of the respondents is medium successful, with much more to be done. The normal deviation of 0.66844 implies that there is moderate variation in responses because on the one hand some people are very pleased about their procurement strategies since they feel it is very successful, and on the other hand, others feel that there are challenges that limit the success of their procurement strategies. This indicates that procurement practices remain imperfect in the sense that they are not yet producing the best outcomes and require optimization.

4.3. Results

H1 - The adoption of green sourcing practices positively affects procurement success in construction projects.

Table 8 Results to H1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.787[a]	.620	.617	.41351

a. Predictors: (Constant), Green Sourcing

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	41.268	1	41.268	241.351	.000[b]
	Residual	25.306	148	.171		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Green Sourcing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.400	.079		5.045	.000
	Green Sourcing	.682	.044	.787	15.535	.000

a. Dependent Variable: Procurement Success

The Model Summary Table gives a summary of the goodness of the regression model that was employed to examine the connection between Green Sourcing practices and Procurement Success. The R-value of

0.787 implies high positive association between independent variable green sourcing and the dependent variable procurement success. This value implies that the more the green sourcing practices are incorporated, the more there is an increased probability of increased procurement success. The R square value of 0.620 shows that 62 percent of the variation in the success of the procurement can be attributed to the green sourcing practices. It is quite a high figure, which leads to the conclusion that green sourcing is a crucial factor that influences procurement outcomes. The Adjusted R Square of 0.617 further indicates that even when the number of predictors is controlled, the model indicates an excellent fit, as it is still explaining a high percentage of the variability in the data. S.E. of the Estimate Of 0.41351 is the mean difference among the difficult numbers that are observed and the difficult numbers that are estimated mathematically by the model. A lower value of standard error suggests that the model's predictions are relatively accurate, with the error being moderate. On balance, the Model Summary indicates that it is true that green sourcing is a good indicator of success in procurement in the construction industry.

The ANOVA (Analysis of Variance) table determines the significance of the regression model based on the statistics. The Sum of Squares will be partitioned into the regression and residual parts, revealing the percentage of procurement success variation by green sourcing the model covers that and that was not. The Regression Sum of Squares of 41.268 shows that the model covers much of the variation in the procurement success, which is through the green sourcing practices. The Residual Sum of Squares is 25.306 Residual Sum of Squares represents the variation that is not explained by green sourcing, thus indicating that the variation in procurement success that is not explained by green sourcing. The ratio between explained variance and unexplained variance is the F value 241.351 which is significantly high (p-value=0.000). The p-value is very small (much less than 0.05, the generally accepted value of significance), which implies that the given model is significant and that the connection between green sourcing and the success of procurement is not random. Therefore, the ANOVA table supports the conclusion that green sourcing has a major role in foretelling the success of procurement in a construction project.

Coefficients table reveals a lot of insight into the effect of green sourcing on the success of procurement. The Unstandardized Coefficients indicate that an increase of one-unit in green sourcing practices leads to an increment of 0.682 units when a firm measures procurement success. This means that, the impact of green sourcing is moderate but influential on the procurement success. The Standard Error of 0.044 quantifies the precision of this estimate and the fact that it is small indicates that the estimate is sound. Standardized Coefficient (Beta) value 0.787 shows that the magnitude of the influence of green sourcing is measured in units of standard deviation. The value of Beta 0.787 is a strong value indicating that green sourcing also exerts a strong positive influence on procurement success thus justifying the conclusion that when green sourcing practice is embraced a much better procurement is achieved. This t-value, which is 15.535, is very high demonstrating the significance of the relationship even more. This large t-value along

with the p- value of 0.000 indicates that the impact of green sourcing to procurement success is statistically significant and there is nearly zero chance that the conclusion is a random affair. Thus the green sourcing does not only correlate with the success of procurement but strongly and significantly affects the latter.

The findings in all the tables, Model summary, ANOVA and Coefficients are very strong arguments to help us come up with a conclusion that supports the hypothesis (H1), which states that, adoption green sourcing practices has positive justifications to the order of procurement success in construction projects. The good value of R, high R Square, and significant F value all affirm that data relationship between green sourcing and procurement success rate is strong, statistic, and significant. Further, according to Coefficients table, the influence of the green sourcing on the procurement success is large as well as significant, namely, Beta is large, and p-value is small. These statistical results raise the conclusion that the more construction companies resort to green sourcing habits, the more successful they are going to be in terms of procurement and other factors, such as lower costs, higher quality and deadlines execution. Therefore, it can be concluded that H1 is right and that green sourcing activities generate a significant and positive effect on success in procurement in construction projects.

H2 - The adoption of advanced technologies, such as AI and block chain, enhances procurement success in construction projects.

Table 9 Results to H2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.773[a]	.598	.595	.42520

a. Predictors: (Constant), Advanced Technologies

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	39.817	1	39.817	220.228	.000[b]
	Residual	26.758	148	.181		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Advanced Technologies

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.164	.097		1.679	.095
	Advanced Technologies	.843	.057	.773	14.840	.000

a. Dependent Variable: Procurement Success

The Model Summary table to test H2 (the hypothesis that the implementation of the advanced technologies, i.e., AI and block chain, does contribute to the increase in the level of procurement success in construction projects) will present the vital information on the robustness and the suitability of the regression model selected as the tool of the analysis. As the value of R = 0.773, this is indicative of high positive relationship between the independent variables (Advanced technologies) and the dependent variable (Procurement success). This implies that the success of procurement is bound to improve as more advanced technologies are adopted. R Square is equal to 0.598, and this fact means that the changes in the outcomes related to the significant success in procurement can be explained with the implementation of advanced technologies by about 60 percent. It is a high value, which means that the model offers good explanation of the data. The Adjusted R Square statistic of 0.595 proves that the model is not overfitting and that the effect of advanced technologies and the relationship does not disappear after adjusting the number of predictors. The number of 0.42520 SE of the Estimate is the mean of the differences between the values that are observed and the predicted values. This indicates that the model's predictions are reasonably accurate but could still be improved slightly to reduce the error margin.

ANOVA table can be used to analyze the overall significance of the regression model. Regression Sum of Squares of 39.817 indicates that inclusion of advanced technologies to the model explains a significant percentage of variation in success of procurement. The Residual Sum of Squares 26.758 is evidence regarding the unexplained variance or the extent to which the success of procurement could not be explained based on single predictor variable, advanced technologies. The value of F test statistic is 220.228 and is used to determine goodness of fit of the entire model. Since the F value is very high, it is evident that the model is significant in a statistical sense and thus it is possible to argue that adoption of advanced technologies is one aspect that lies behind explain ability of procurement success. A Sig. (p-value) = 0.000 proves that the model is of high statistical significance, and the possibility of observing the non-accidental association between advanced technologies and procurement success is negligible. This reinforces the argument of the usefulness of advanced technologies in procurement.

The Coefficients table gives a closer relation on the relationship that exists between advanced technologies and procurement success. The Unstandardized Coefficients measures state that one unit deviation in the

adoption of advanced technologies will entail one-unit deviation of procurement success. This implies that advanced technologies have considerable positive impacts on procurement outputs, that is, the higher use of technologies, the more successful procurement. Standard error of 0.057 means that the level of precision at which the coefficient is estimated is high. The Standardized Coefficient (Beta) of 0.773 points to the intensity of the effects of advanced technologies on the success of procurement on the measure of standard deviation. The Beta of 0.773 is very high meaning that advanced technologies in adoption is a very strong predictor of a successful procurement. The t-value 14.840 is very large hence indicating that the coefficient of the advanced technologies is significant. Such a big t-value makes it easy to understand that the correlation between advanced technologies and the success of procurement is strong and not some coincidence. Lastly, the Sig. (p-value) = 0.000 indicates that the coefficient is significant, and the likelihood that this finding was due to chance is incredibly low.

Altogether, the findings of the Model Summary, ANOVA, and Coefficients tables are convincing enough that the findings will validate H2, which assumes that using advanced technologies, like AI and block chain, can lead to a higher level of procurement success when it comes to construction projects. The R-value of 0.773 and R square of 0.598 indicate that the advanced technologies contributes highly to the variation in procurement success. The ANOVA analysis proves the statistical significance of the model, and the Coefficients table indicates that there is a strong positive dependence between advanced technologies and success in procurement with Beta of 0.773 and t-value of 14.840 that proves to be high. This is further affirmed by the p-value of 0.000, which is significant. Such findings imply that use of modern technologies is, in fact, a crucial element in the improvement of service delivery in terms of procurement in the construction sector. Thus, the H2 is accepted, and it is proved that advanced technologies, including AI and block chain, positively affect the success of the procurement of construction projects significantly.

H3 - Strong supplier relationship management improves procurement success in construction projects by enhancing reliability and performance.

Table 10 RESULTS TO H3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.756	.755	.33103

a. Predictors: (Constant), Supplier Relationship Management

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.357	1	50.357	459.553	.000[b]
	Residual	16.218	148	.110		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Supplier Relationship Management

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.075	.072		1.028	.305
	Supplier Relationship Management	.885	.041	.870	21.437	.000

a. Dependent Variable: Procurement Success

The hypothesis it tests according the presented statistical analysis is the hypothesis that is to improve procurement success of a construction project by nurturing strong supplier relationship management (SRM), thus contributing to the enhancement of reliability and performance. The regression model used to do this analysis is a regression model whose predictor variable is Supplier Relationship Management and Procurement Success being the dependent variable. These findings (found on the Model Summary, ANOVA tables, and Coefficients table) allow a good case to be made to support the hypothesis.

The Model Summary table is a reconstruction of regression model goodness-of-fit. The value of R is 0.870 that specifies very strong positive relationship between Supplier Relationship Management (SRM) and Procurement Success. This shows that there is correlation between the level of supplier relationship management and the success of the procurement and therefore it is clear that SRM plays a significant role in helping to improve procurement performance in construction projects.

The result of R Square is 0.756, which implies that the value could be attributed to about 75.6 % of the variance in the success of procurement due to supplier relationship strength. This percentage is very high indicating that SRM is of critical importance in shaping up procurement results. Moreover, the Adjusted R Square of 0.755 takes into account the number of predictors in this model and indicates that the model remains highly effective in explaining things even with adjustments. The 0.33103 Standard Error of the Estimate is comparatively small, which means that the estimations of the regression model that are made are rather accurate, and the error is relatively low.

The ANOVA (Analysis of Variance) table will establish the significance of (of regression model overall). The Sum of Squares is decomposed as regression and residual. Regression Sum of Squares of 50.357 indicates that Supplier Relationship Management explains quite a big part of the natural variability in the success in procurement whereas Residual Sum of Squares of 16.218 is the variability that is unexplained by the model.

The F value of 459.553 is very large and this means that the regression model is an important determinant of the variation in procurement success. The p-value =0.000 is far much below the level of significance of 0.05, which is the cutoff point of significance implying that the regression model is significant and the correlation between SRM and procurement success is not a chance effect. This is a very strong indication that indeed supplier relationship management is a major driver of a successful procurement in construction projects.

The Coefficients table gives us a clear account of the disclosure of this association amid Supplier Relationship Management and Procurement Success. The Unstandardized Coefficients indicate that a one increase in the supplier relationship management will yield 0.885 units increments in procurement success. This shows that there is a significant positive impact of SRM on the outcomes of procurement implying that strengthening supplier relations will foster significant change in the outcome of the procurement.

Standard Error of 0.041 is not huge, which means the estimate of coefficient of Supplier Relationship Management is accurate and trustworthy. The Strength of the relationship is presented as the 0.870 Standardized Coefficient (Beta) which is measured in units of standard deviations. Beta value of 0.870 represents that SRM influences procurement success in a manner that is very strong. This indicates that robust supplier relationships are probably the most powerful factors, which predict and demonstrate future successful procurement in construction projects.

This t-value of 21.437 is extremely high and this further supports the statistical significance of the relationship. The chances that this result is caused by the random chance alone are close to zero with such a high t-value. The p-value of 0.000 shows that the coefficient Supplier Relationship Management is statistically significant and that there is overwhelming evidence that SRM has a useful effect on the procurement success.

The outcome of Model Summary, ANOVA, Coefficients tables give a strong argument to support that effective supplier relationship management (SRM) directs to successful procurement in construction development through increased reliability and performance. The R value 0.870 and the R Square 0.756 has indicated that SRM as a good predictor of the success in procurement and it explains that nature of variation of the outcomes in the procurement based on SRM by more than 75 percent. The ANOVA indicates that the regression model is highly significant, and the Coefficients table shows that there is a high positive

relationship between SRM and procurement success with Beta value of 0.870 and t-value of 21.437. The results indicate a high level of support on the hypothesis that good supplier relationships play an essential role in effective procurement and thus H3 is embraced. This validates the fact that supplier relationship management is a prerequisite to the success of procurement in construction projects that enhance performances of the suppliers as well as the procurement processes.

H4 - Effective risk management practices, such as supplier diversification and contingency planning, positively affect procurement success in construction projects.

Table 11 Results to H4

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.753[a]	.567	.564	.44117

a. Predictors: (Constant), Risk Management

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	37.769	1	37.769	194.054	.000[b]
	Residual	28.806	148	.195		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Risk Management

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.020	.116		-.176	.861
	Risk Management	.985	.071	.753	13.930	.000

a. Dependent Variable: Procurement Success

This is because the statistical values obtained and displayed in the tables analyze the correlation between quality risk management practice and success in procurement as per the hypothesis H4. Results of the regression analysis indicate high probability to prove the research hypothesis that effective risk management approaches, including supplier diversification and contingency planning, have positive effect on the success of procurement. The **R value** of 0.753 implies that there is a strong positive relationship between risk management and the success of the procurement practices which means that, the more the risk management practices are detailed, the higher the procurement success is expected to attain. Moreover, the

R Square value is 0.567, showing that about 56.7 percent of the variance in the procurement success may be attributed to the different practices undertaken in risk management activities. This is quite a high figure underscoring the crucial role of risk management in enhancing procurement success but also that other determinants to procurement success exist. The model power can be also supported by the fact that the value of Adjusted R Square is 0.564, which means that the model is not over fit, and it still describes the relationship between two variables well.

The F value of 194.054 in the `ANOVA table connotes that the regression model is very significant. This F statistic is a ratio between the explained variance of the results of procurement success (because of risk-management) and the unexplained variance, with the extremely high F value indicating that the model fitted the data well. This is supported by the **p-value** of 0.000 which indicates the probability of the relationship between practices of risk management and successful procurement was unlikely achieved by mere chance. Such statistical significance indicates that risk management is a very vital factor in attaining successful procurement results in construction sector.

The Coefficients table gives even greater explanation to the strength of the correlation between the risk management and the success of procurement. The unstandardized coefficient (B) of 0.985 implies an increase in procurement success by 0.985 units per unit gain in the quality of risk management practices carried out. This shows that there was a high positive resists of risk management on the procurement. This is further strengthened by the fact that the standardized coefficient (Beta) of 0.753 reveals that risk management is a strong indicator of procurement success. The **t-value** of 13.930 is very high and the coefficient is statistically significant and the relationship between the two variables is very strong. This finding is supported by the **p-value** of 0.000 that proves that risk management strategies pertaining supplier diversification as well as contingency planning are imperative when it comes to increasing the success of the procurement process.

Altogether, the statistical analysis indicates that the risk management including efficient practices, e.g., supplier diversification and contingency planning, is a key element affecting the improvement of procurement success at a construction project. The consistent picture in the results of the **Model Summary**, **ANOVA**, and **Coefficients** tables leads to the conclusion that to improve procurement outcomes, it is necessary to have in place the effective risk management practices. Consequently, the hypothesis (H4) is accepted because risk management practices indeed play a significant role in helping to enhance the success of the procurement process in construction projects.

H5 - Local sourcing strategies enhance procurement success by reducing supply chain disruptions and improving material availability.

Table 12 Results to H5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856[a]	.732	.731	.34692

a. Predictors: (Constant), Local Sourcing

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.762	1	48.762	405.152	.000[b]
	Residual	17.813	148	.120		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Local Sourcing

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.169	.073		2.332	.021
	Local Sourcing	.825	.041	.856	20.128	.000

a. Dependent Variable: Procurement Success

The hypothesis H5 explains that local sourcing strategies are originated as a way of increasing the success of the procurement process due to less supply chain disruption and better access to materials and results of the statistical analysis of hypothesis H5 demonstrate significant results that prove this hypothesis true. Such a **R-value** (0.856) shows a very strong positive relationship between local sourcing and success in procurement. This indicates that with the implementation of local sourcing strategies, the probability of success in the procurement process increases as the risk is likely to fall as well as the unreliability of supply chains since the materials will also be sourced locally. The R square value of 0.732 indicates that 73.2 of the variance in the procurement success could be attributed to the implementation of local sourcing strategies showing that local sourcing has significant contribution when intended to achieving better procurement outcomes. The strength of the model as determined by the **Adjusted R Square** value that takes into consideration the number of predictors in the model has a value of 0.731 which further confirms the strength of the model since the findings are not overestimate.

In our ANOVA table, the F value of 405.152 is a huge value, which denotes that the regression model is also extremely important. The high F value means that the model accounts very big portion of the variance in procurement success. A p-value of 0.000, a value that is very low and the level that is usually used in

determination is 0.05, makes it clear that there is no random chance as there is a relationship between local sourcing and procurement success. Such findings mean that local sourcing techniques are a relevant and valuable consideration when it comes to enhancing the success of procurement, and once again supports the notion that the implementation of such solutions can address the supply chain risk factor and positively affect availability of materials.

The table titled **Coefficients** further explicates further about the impact of local sourcing to the success of procurement. The unstandardized coefficient of 0.825 means that each increase in the local sourcing score by 1 is associated with the increase in the success of procurement by 0.825 units. This shows that there is a huge positive impact of the local sourcing on the outcome of procurement. The finding was further reinforced by the fact that the **standardized coefficient** (Beta) = 0.856 indicates that local sourcing is a very strong indicator of success during procurement. T-value 20.128 is almost huge implying that the difference between the effects of local sourcing on success of procurement has significant implications to a large degree. This is further supported by the **p-value** of 0.000 that indicates a strong indication that the association between local sourcing and the success of procurement is unlikely to be because of chance average.

To sum up, a hypothesis that local sourcing strategies can increase the success of procurement in construction projects by decreasing the probability of supply chain disruptions and by improving the availability of materials is highly confirmed by statistical analysis. By indicating that local sourcing is a significant determinant of the success of the procurement process, the **R-value** and the **R square** demonstrate the validity of the relationship between the two, whereas the **ANOVA** and **Coefficients** tables further indicate that the relationship involved is statistically significant. Thus, **H5 is supported** and local sourcing strategies are proven as a good tool in increasing the success of procurements in construction projects.

H6 - The use of performance-based procurement practices leads to higher procurement success by ensuring better supplier performance and accountability.

Table 13 Results to H6

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.870[a]	.756	.755	.33104

a. Predictors: (Constant), Performance

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	50.356	1	50.356	459.513	.000[b]
	Residual	16.219	148	.110		
	Total	66.575	149			

a. Dependent Variable: Procurement Success

b. Predictors: (Constant), Performance

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.067	.073		.924	.357
	Performance	.986	.046	.870	21.436	.000

a. Dependent Variable: Procurement Success

A strong set of facts that evolve supporting the hypothesis H6, which is based on the idea that the use of the performance-based practices of procurement will increase the procurement success due to the improved performance and accountability of the suppliers, is statistical analysis that is presented. A very strong positive relationship between Performance (as a procurement practice) and Procurement Success is reflected through the R-value of 0.870. This implies that the more these performance-focused practices are embraced, the better chances they have to attain success when it comes to procurement. The R Square of 0.756 means that 75.6 per cent of the difference in the success of procurement can be attributed to the practices involved in the performance-based procurement. This is a large number, which demonstrates the role of performance as having significant influence regarding outcomes of the procurement. The Adjusted R Square of 0.755 also indicates that the model is very good, taking into consideration the number of predictors, indicating that the relation is good and not over exaggerated.

The value of the F in ANOVA table (459.513) is very large indicating that the regression model is statistically significant. The F value analyses whether the model is good in describing the variability in the success of the procurement activity and a high F value indicates that the model is fit with the data. With the p-value at 0.000, which is far much below the prevailing level of 0.05, it can be inferred that the connection between performance-based procurement practices and procurement success cannot be a placebo effect. This is a very strong indicator that performance based procurement practices are a key success factor in procurement.

The Coefficients table will give a more detailed information about the relationship strength between the performance and procurement success. Unstandardized coefficient (B) of 0.986 implies that every one-unit

growth in the adoption of the performance-based procurement practices will bring an increment in the level of the procurement success by 0.986. This is a large favorable impact implying that performance based practices are important in promoting positive results of procurement by guaranteeing performance and liabilities of better suppliers. The standardized coefficient (Beta) of 0.870 further supports this by indicating that performance-based procurement practices is a very powerful predictor of success in procurement practice. The value of t = 21.436 is very large showing that the coefficient is significant. This large empirical value of t also indicates that the association between performance-based procurement and success of procurement is resolute and not probable to have occurred unexpectedly. The p-value of 0.000 is then indicative of a high degree of significance of the coefficient and demonstrates that the established practice of performance-based procurement in the procurement processes has a definitive outcome towards improved procurement performances.

In general, the findings of the Model Summary, ANOVA and Coefficients tables provide strong evidence in favor of H6. All three measures directed at the performance-based procurement practices, the R-value, R Square, and the Adjusted R Square reveal that there is a strong and significant relationship between performance-based procurement practices and procurement success. ANOVA results attest the model is highly statistically significant and Coefficients table demonstrates that the impact of performance-based procurement practices as predictor on the procurement success is large and even significant. Hence, H6 is accepted indicating that utilization of performance-based procurement practices increases success in procurements through improving the performance and accountability of suppliers.

4.4. Summary of Hypothesis

Table 14 Summary of hypotheses

Hypotheses	Status
H1 - The adoption of green sourcing practices positively affects procurement success in construction projects.	Accepted
H2 - The adoption of advanced technologies, such as AI and block chain, enhances procurement success in construction projects.	Accepted
H3 - Strong supplier relationship management improves procurement success in construction projects by enhancing reliability and performance.	Accepted
H4 - Effective risk management practices, such as supplier diversification and contingency planning, positively affect procurement success in construction projects.	Accepted
H5 - Local sourcing strategies enhance procurement success by reducing supply chain disruptions and improving material availability.	Accepted

H6 - The use of performance-based procurement practices leads to higher procurement success by ensuring better supplier performance and accountability.	Accepted

CHAPTER 05 – DISCUSSION & RECOMMENDATION

5.1. Discussion of Results & Findings

H1 - The adoption of green sourcing practices positively affects procurement success in construction projects.

The creation of a strategy involving green sourcing in construction procurement has become a relevant subject of interest with the rising global demand in sustainability and accountable environmental processes. Green sourcing is referred to as a process of choosing suppliers, materials, and services that comply with environmental and ethical guidelines and this aspect in procurement strategies is a core value now. This hypothesis (H1) is that green sourcing is also beneficial in enhancing procurement success because it is not only effective in enhancing environmental sustainability, but also the nature of operations as well as the success of procurement. In this research, the positive relationship between green sourcing and success in Procurement is relatively in line with past studies, which have emphasized that the same practice can mitigate risks, improve supplier relationships, and thirdly, the overall procurement process in construction projects.

Compared with the classic forms of procurement where the key driver is cost minimization, green sourcing is more holistic in the sense that it incorporates an environmental and social dimension in the procurement decision process. This trend is consistent with the arguments presented in Ajiboye et al. (2024), who note that green sourcing does not only provide environmental benefits but also helps generate long-term cost savings due to the environment and logistic benefits of the improved management of resources and resources waste generation and the efficiency of supply chain. In addition, as it was highlighted in the investigation by the Alastal et al. (2025), green sourcing leads to more supplier relationship because the suppliers have incentive to comply with high environmental and quality demands. This is in line with the present study that the green sourcing practices leads to procurement success through reliability in the suppliers and availability of materials at the right time, thus minimizing the chances of disruptions in the supply chain.

The significance of green sourcing is not only reflected by the Triple Bottom Line (TBL) model, which promotes the company to look at economic, environmental and social objectives of their sourcing. Based on the information provided by Ajiboye et al. (2024), TBL approach would require the modification of the rules of making procurement decisions, which cannot be limited by the lowest cost points rather should be

prioritized to indicate the long-term value, sustainability, and social responsibility of the materials and suppliers. In construction terms, this implies that green sourcing activities, often entailing the choice of environment friendly materials and siphoning into ethical suppliers, orchestrate the procurement with the larger objectives of sustainability. The evidence found in this research backs up this viewpoint, since it shows that green sourcing has the effect of adding to success in procurement by encouraging sustainability and enhancing transparency and accountability throughout the supply chain.

The other dimension brought to light in the earlier research is the importance of regulatory measures in encouraging the uptake of green sourcing as a construction procurement method. With the tightening of environmental regulations, construction firms are becoming more and more pressured to embrace sustainable procurement practice in line with the local and international standards. According to the study by Alastal et al. (2025), green building certification like LEED and ISO 14001 is important because they will uphold standards relating to global sustainability in terms of procurement decisions. The findings in this paper echo these findings given the fact that it has been revealed that procurement success is maximized by having firms adhere to green sourcing practices that adhere to the environmental standards to guarantee the sustainability of their project across a long-term period increasing stakeholder confidence in the process.

Although it is evident that green sourcing is a beneficial practice, adoption of such practices in the construction industry does not come without challenges. As noted by Sahu et al. (2023), costs, a shortage of green materials and failure to achieve transparency between suppliers can often be the limiting factors of adopting sustainable procurement practices. The challenges may render the use of green sourcing practices quite elusive in the procurement strategies of construction companies especially in a very competitive and price conscious market. Nevertheless, the results of this paper imply that the incentives of green sourcing, including risks mitigation of the supply chain and enhanced provider integrity, exceed the expenses of green sourcing on the first glance because they lead to the achievement of purchases in the end.

In summary, the findings of the research lend credence to the theoretical premise that implementation of green sourcing is effective in delivering positive effects on construction in relation to procurement. It is in line with the existing literature findings, which point out the environmental, economic and social advantages of green sourcing and especially in the construction sector. Green sourcing practices allows construction firms to minimize the interference in the supply chain, enhance the availability of materials and develop a greater bond with the suppliers, which will result in increased procurement success. Nevertheless, one should mark that realization of successful implementation of green sourcing is impossible in case of absence of overcoming a number of barriers existing such as the large expenses and insufficiency of resources of sustainable materials. However, it is possible to view green sourcing as a potentially useful tool in the improved success of the procurement process within construction project, in addition to greater

sustainability objectives, and increased competitiveness of the construction company within the modern environmentally-friendly market.

H2 - The adoption of advanced technologies, such as AI and block chain, enhances procurement success in construction projects.

H2: The usage of the cutting-edge technology like AI and block chain in the construction project can increase the success of the procurement process, which is consistent with the existing research studies that have touched upon the effect of technological innovations on the procurement process in the context of different industries. However, over the past couple of years, there has been a growing trend in the construction industry of using AI, block chain, and other digital technologies, in a bid to enhance their efficiency in operations and better results in procurement. Research has always agreed that such technologies could help to enhance the success in procurement considerably, as they help to streamline the process in terms of both decision-making and transparency, as well as more accurate monitoring of materials and services.

According to research by Lee et al. (2020), AI was identified as one of the methods that could automate the procurement related to supplier selection, contract management, and cost estimation, resulting in procedures that are more efficient and fewer mistakes in procurement. The enormous data that AI-powered systems can analyses can give insights that will enable more informed decisions to be made in procurement thereby enhancing the success of procurement. This also aligns with the results of the present study, which show that AI and other emerging technologies, including block chain, are a big contribution to improving the results in procurement. Improved demand forecasting has also been identified in the application of AI in procurement, lowering the likelihoods of supply chain failures and material availability that directly affects the success of the procurement process (Zhang et al., 2021).

In the same vein, block chain technology has attracted a lot of interest over the last several years, due to its capability of increasing transparency, security, and traceability of procurements. According to the study by Murray (2020), not only does the adoption of block chain in procurement allow a better supply chain management in terms of the authenticity of the materials used, but it also increases the trustworthiness of the transactions with suppliers. Block chain is more efficient in the procurement process because it enhances accountability and cases of fraud implementation by offering an irreversible ledger of transactions. This is in line with the present study that procurement success has a connection to block chain technology by providing integrity as well as reliability of these supplier relations.

The success of block chain in procurements is also highlighted in the study by Pereira et al. (2019) who reported that the technology would automate payments, monitor material in real-time, and result in transparent, auditable procurement procedures. This minimizes chances of inaccurate results or bottlenecks

and increases efficiency in the procurement field. The current study has demonstrated all these benefits, as well as indicating that when the block chain is used it will contribute to better construction-industry procurement results.

Besides the working needs, strategic benefits of implementing high technologies in the sphere of procurement have also been also identified in studies. Ajiboye et al. (2024) note that using such technologies as AI and block chain enables procurement teams not only to streamline daily work but also to align procurement activities with overall business objectives in a better way. Such technologies can assist construction companies in terms of supplier relationship management, cost-pressed environment, and sustainability, which are all aspired about procurement success. These arguments are corroborated by the present study, which identifies that opening up the space of AI and block chain is essential to the success of procurement in construction projects.

Other studies have also acknowledged the challenge of adopting AI and block chain in procurement. These points were mentioned by Sahu et al. (2023) as the high costs of initial investment into introducing such technologies and the absence of expertise in the sphere of construction that on the one hand can be a severe obstacle to the further spreading of such technologies. Such issues are especially topical to construction industry in which acceptance of new technologies was much slower than in other industries. Nonetheless, it has been noted by research that the acquisition of higher technologies in the long term does way outsmart the early expenditure, and even companies that adapt the top technologies have shown positive and high change in the procurement processes and delivery times of the projects.

Altogether, the conclusions of the current research align with the results of a previous study that proves the beneficial effects of innovative technologies like AI and block chain on the proper performance of the procurement process. These technologies can assist in realizing the goals of procurement by automating important processes, making processes more transparent, and supporting performance of suppliers and ensuring accountability. The present study strengthens the assumption that the building industry (as well as others) can gain a lot due to the implementation of AI and block chain, so the technologies are indispensable factors of commercial success in the new landscape of the construction industry and procurement as well. With the ongoing development of the construction industry, there will also be an increased focus on the role of AI and block chain in the procurement strategies, and the two facts will help firm the idea that the specified technologies are crucial determinants of procurement success.

H3 - Strong supplier relationship management improves procurement success in construction projects by enhancing reliability and performance.

Effective supplier relationship management has substantial impacts on the performance of the procurement process in construction projects, as the regression analysis carried out on supplier relationship management

(SRM) and procurement success seems to have proven. The hypothesis that SRM enhances procurement success by improving reliability and performance is supported by the statistical findings, as indicated by the model's high R and R square values. The R-value of 0.870 indicates strong positive relation between SRM and success of procurement with regard to the fact that there is clear correlation between the quality of supplier relationships and success of procurement activities. This finding is consistent with previous research that emphasizes the need to use SRM in the building industry. An example is the study by Porter and Millar (1985) who focused on the importance of supplier relationship on competitive advantage that is directly related to success in procurement.

Also, an R square value of 0. 756 shows that the strength of supplier relationships can explain around 75.6 percent of the variance in the success of procurements. This is quite a significant ratio, and it reiterates the importance of SRM on procurement performance. This is congruent with a past study by Petersen et al. (2014), which established that quality supplier relationship determination has a beneficial impact on efficiency and effectiveness of the construction project procurement processes. In addition, adjusted R square of 0.755 supports the result that the model is strong and considering the number of predictors specified and indicates that association between SRM and procurement success is significant even after adjusting the potential confounding variables are controlled.

The ANOVA output also confirms the statistical significance of the model, whereby the value of F is very large at 459.553, which shows that the regression model is highly significant in the variation of the variable with the aim of explaining procurement success. A p-value of 0.000 proves highly significant compared to the level of significance of 0.05 further reinforcing the provision that the association between SRM and procurement success is not a coincidence but a real and statistically significant relationship. The outcome is in line with other literature where Duffy (2017) has established that supplier relationships can play an important role in overall effectiveness of the procurement process in construction projects to enhance the quality and timeliness of goods and services delivered.

The table of coefficients gives more information on how strong the correlation between SRM and procurement success is. The unstandardized coefficient (B) implies that when the quality of supplier relationship management increases by one unit, procurement success will increase by 0.885. These shows how significant the positive effect of good supplier relationships on procurement results are focusing on the necessity to cultivate good and high-performance suppliers. The standardized coefficient (Beta) which was 0.870 implies that, SRM is a highly reliable predictor of the success of procurement, which shows that SRM has a greater effect on the success of procurement relative to many other phenomena. This is topical especially in construction where the performance of suppliers and their reliability may be the most important elements of any construction project.

Statistical significance of the coefficient is also evident given the t-value of 21.437 and a significant p-value of 0.000. The t-value is so high to show the relationship between SRM and procurement success has not only been found to be statistically significant but practically vital. The p-value of (0.000) ensures probability of chances of occurrence of results is minimum, and there exists an overwhelming evidence that SRM is a major contributor to success of procurement of construction projects.

This is in line with the findings of other research done by various authors who have researched on the association of SRM and success in procurements in construction. To illustrate this point, a study by Gronroos (2011) revealed that optimal supplier relationship management does deliver better procurement results including the saving of cost, enhancement of quality and timely deliveries, all of which contributes to the success of construction project as a whole. Similarly, a previous research by Kaufmann and Carter (2004) revealed that longer-term supplier relationship on a construction project also results in improved trust, collaboration, and performance, and this final effect is seen to provide improved procurement success. Therefore, the results of this regression analysis give strong evidence that a good supplier relationship management is an aspect that plays an essential role in the enhancement of procurement success in construction projects. The R and the R square values are high and the significance of the coefficient is significant in reflecting that SRM has a significant influence on procurement outcome because it improves supplier reliability and performance. This finding is in line with literature about the criticality of supplier relationships in procurement and only serves to strengthen the interest hypothesis that SRM is an important determinant of procurement success in construction industry. Thus, the test of the hypothesis H3 results in accepting in that there is a significance to cultivating effective supplier relationships so that, in the construction projects, successful procurement outcomes are achieved.

H4 - Effective risk management practices, such as supplier diversification and contingency planning, positively affect procurement success in construction projects.

Analysis of hypothesis H4 indicates a positive relationship between beneficial risk management options, such as supplier diversification and contingency planning on the success of procurements in construction projects. It is revealed that risk management is playing an important role in determining the outcome of procurement as there is strong positive association between the two independent variables with an R-value of 0.753. This implies that the risk management practices should be better and more organized the better the chances of realization of procurement success. This is further addressed by the R-squared value of 0.567 where nearly 56.7 percent of the variance in success of procurement can be attributed to the types of risk management practice that has been applied. The p value of 0 and F value of 194.054 proves the contribution of risk management to the procurement outcome to be very important as indicated by the statistical significance. These findings are synonymous with those of past researchers, like those by Matsoma & Ambe (2024) and Aziz et al. (2024), who have claimed that the risks in the procurement process may be mitigated

using risk management strategies, which include supplier diversification. Moreover, Aziz et al. (2024) imply that digital solutions and predictive analytics tools can further increase the effectiveness of the practices and enable construction companies to mitigate the impact of supply chain disruptions proactively and make decisions more effectively.

When making a comparison of the current findings and those of previous literature, it is erroneous to say that risk management is not a part of the procurement success, not least in the construction business where supply chains can often be disrupted. The significance of diversified sourcing and contingency planning in terms of the procurement resilience in the context of volatile times was also mentioned by the research by Stephen et al. (2025) and Sahu et al. (2023). This is reconfirmed by the current analysis, which shows the risk management practices have not only helped in enhancing procurement success but also making the supply chain stronger and flexible. These results are also evidenced by a study by Sahu et al. (2023), which stressed that focusing on risk management practices, including having a diversified supplier and contingency contract formation, is necessary to ensure the procurement efficiency and flexibility over any supply chain disruptions. Further, the opportunity to adjust to the disruption and modifications in the supply chain by workably managing risks offers an aggressive advantage, as observed by Sahu et al. (2023), which is significant to the accomplishment of long-run procurement performance.

In addition, Matsoma & Ambe (2024) emphasize the idea of resilience in procurement, especially when encountering sudden shocks or disruptions. They state that by involving good risk management systems, construction businesses will be in a more prepared state to adapt to any supply chain disruptions, whether this is due to geo-political complications, natural calamities, or even economic changes. This view is replicated in the present study, which demonstrates that organizations that have a well-planned risk management policy involving diversification of their suppliers and contingency planning are better placed to have procurement success. Hence, the findings of the analysis substantiate the hypothesis that efficient risk management approaches, including supplier diversification and backup planning, play the key role in enhancing the success of procurement in construction projects. This is in line with past studies, which have highlighted the importance of risk management towards procurement resilience and efficiencies. Since the statistical data hold a sufficient number of data and can be logically attributed to the already carried out research, one should conclude that it would be wise to promote the level of risk management in companies that seek to achieve better results in the construction procurement process by minimizing chain interruptions and maintaining an adequate material supply. Therefore, hypothesis H4 is accepted and the research hypothesis is true, and risk management practices indeed contributes a lot in enhancing the outcomes of procurement in the construction sector.

H5 - Local sourcing strategies enhance procurement success by reducing supply chain disruptions and improving material availability.

The results of the correlation between local sourcing strategies and the success of the procurement activities in the construction projects are important to note that using local suppliers of the construction material can be an effective method of minimizing the disruption in supply chain operation and enhancing material availability. The results heavily favor the hypothesis of the benefit of local sourcing to the procurement success. These results are similar to the others that have been made by previous researchers when addressing the issue of sourcing strategies and its effect on the performance of procurement more so in a situation where supply chains are disrupted like the case during the COVID-19 pandemic.

The supply chain that has always been utilized in the construction industry enabling it to procure materials at competitive rates across the world has in recent times come into question especially after the global logistics and supply chains were disrupted. A study by Ajiboye et al. (2024) and Bello et al. (2024) highlights that besides the cost advantage, global sourcing brings other issues, including an extended lead-time, geopolitical volatility, and exposure to exogenous shock. Such issues, which were brought to the fore by the COVID-19 crisis, have pushed numerous construction companies toward the re-evaluation of their reliance on global sourcing to a more robust approach of local sourcing. This study findings are therefore consistent with these earlier findings showing that local sourcing offers opportunities of dealing with these risks by minimizing the dependence on suppliers located far and away, as well as reducing supply chains, which all ends up to better procurement success.

Earlier studies, as it is reported by Sharifzada & Deming (2024) reveal that local sourcing has some benefits when it comes to avoiding delays, enhancing supply chain visibility, and making deliveries faster. All these play a crucial role in the success of the construction project in terms of delivery time, as small delays in the supply of material may lead to serious delays in the project and subsequent larger budgetary requirements. These advantages are also reflected in the findings of this research as they demonstrate that local sourcing strategies are capable of enhancing the availability of materials and assure the generally reduced vulnerability of procurement activities to the adverse effects of shipment destabilization within the supply chain. Global sourcing, on the other hand, can be very cost effective but with numerous logistical problems and delays, particularly in high volume construction projects with many types of material suppliers in different regions of the world.

Yet, local sourcing is not an ideal solution, as explained by Sahu et al. (2023), who believe that local sourcing can cause price increases in the materials and the shortage of some specialized materials. These findings are supported by the present study, which reveals that although local sourcing improves the procurement performance, as it will guarantee the constant inflow of materials, it may also be associated with tradeoffs, in the form of higher material cost, in particular. Nonetheless, such disadvantages are

outweighed by the advantages of local sourcing: the elimination of the risks of global supply chains and the enhancement of material availability. Additionally, with more construction companies trying to become sustainable and less impactful into the environment, local sourcing also fits sustainability standards by cutting the environment impact caused by transportation and boosting the local economy, according to Ajiboye et al. (2024).

The trends towards increased local sourcing are also accompanied by a trend of hybrid sourcing being increasingly deployed, which incorporate the advantages of both local and global sourcing. This approach enables construction firms to achieve cost-effectiveness as well as having the responsiveness and reliability that local companies are able to provide. As mentioned by Zandee et al. (2024), a hybrid strategic approach allows businesses to obtain materials that can be found on a local level, and yet enjoy the price benefits of global suppliers of particular materials. Not only does this enhance levels of success in procurement; it is also able to guarantee that the projects are carried out on time and on budget.

In conclusion, the findings of the research give solid arguments that local sourcing practices play a significant role in increasing success rate of procurement in the construction projects due to use of less number of links in the supply chain to minimize interruptions in supply chain processes and succeed in providing materials to the extent of ensuring the timely completion of the procurement process. This aligns with the findings of the past literature that underlines the benefits of local sourcing, specifically, relating to shortened lead times, supply chain robustness, and meeting sustainability objectives. As much as local sourcing might be accompanied by challenges, (including increase in the cost of material) the challenges can be overcome by making use of hybrid sourcing models, which integrate the positive aspects of the two sourcing models. Thus, hypothesis H5 is accepted in which local sourcing is a critical means of promoting the success of procurement in the construction sector.

H6 - The use of performance-based procurement practices leads to higher procurement success by ensuring better supplier performance and accountability.

Performance-based procurement practices are crucial to the success of procurement in any construction project since they emphasize upon improved supplier performance and responsibility. Hypothesis H6 (these practices result in better outcomes of procurement) is also proven by statistical analysis with a great degree of certainty. The R square value of 0.756 shows that the proportion of the variation of the procurement success could be explained by the performance-based practices and it is equal to 75.6, which proves the existence of the very strong connection between the two variables. F-value 459.513 also confirms the statistical significance of the model thus demonstrating the thoughts that the more construction companies embrace performance based procurement practices, the more effective their procurement success will be.

This finding is in line with observations that were reached by different previous studies in the area and to the significance of supplier performance and accountability in procurement activities. A study by Cherian et al. (2021) and Mansoor et al. (2021) indicates that the procurement methods that guarantee performance-based outcomes can have a direct beneficial effect on the delivery of the projects. These surveys point to the fact that the success of procurement is not necessarily dependent on cost factors but the supplier's quality and performance play a dominant role. Along these lines, the statistical evidence of the present analysis supports the idea that the suppliers held accountable to their performance under performance-based contracts play a role in increasing the success of the procurements.

Moreover, such hypothesis is further evidenced by the coefficient values, in the present research. The value of an unstandardized coefficient 0.986 means that the increase of performance-based procurement practices adoption by a unit will affect the procurement success improved by 0.986. This demonstrates a significant and measurable effect, which means that incorporation of these practices can have a significant effect on improving procurement success. The high-standardized coefficient (Beta) of 0.870 also indicates performance-based procurement practices as one of the most significant factors that can foretell success in the construction industry with respect to procurement. This value of t = 21.436 is high enough to ascertain the significance of the coefficient or that the relationship existing between performance-based procurement and procurement success is not due to chance.

This research coming up with similar results is in line with the findings made by other researchers who have developed a relationship between procurement achievement and performance-based practices. To illustrate, the study by Stephen et al. (2023) and Sahu et al. (2023) emphasizes that the efforts to rely on performance measures in the context of procurement policies guarantee better efficiency, promptness, and cost-effectiveness. This is more so in construction works where failure to deliver or problems with delays may cause huge financial cost. In performance-based procurement practices, more risks can be mitigated since the suppliers are motivated to reach the performance mark or even supersede in order to either escape punishment or earn incentives. This conforms to the findings of the current study, which propose high accountability among the suppliers to align directly to better procurement success.

Finally, hypothesis H6 was found to be solid as demonstrated in the present analysis, which proved the importance of performance-based procurement practices in enhancing success in the procurement of construction projects. According to the literature, this conclusion is consistent with the literature that have consistently supported importance of supplier performance and accountability as contributing factors in the procurement outcomes. These findings indicate that construction organizations that have integrated such practices into their procurement procedures have a higher probability of attaining superior performances related to cost, time, and quality eventualities occasioning more successful post-project results.

5.2. Conclusion

This study was aimed at investigating how different practices of strategic sourcing influence the success of procurement in the construction industry. The study sought to give a broad picture of how these practices impact on procurement process by conducting a detailed analysis of green sourcing, supplier relationship management (SRM), advanced technologies and risk management practices. The findings showed that the integration of such strategic practices has a high positive effect on the success of procurement and each of the practices has a contribution toward different procurement areas like costs efficiencies, availability of materials, supplier performances, and the overall success of the project.

The results obtained in the study show that the green sourcing activities though problematic drive success of procurement as they ensure resources sustainability and reduce the threat of environmental risks. This would be in line with the increased focus on sustainability in the construction sector, as more companies look to adapting environmental and social procurement policies. Equally, advanced technologies, such as AI and block chain, have been proven to enhance the procurement process through their effectiveness, minimized risks, and verification of supplier dealings. The importance of supplier relationship management cannot be over emphasized, where the identified study noted that better supplier relationships characterized with more collaboration will result to better performance and reliability which are important issues in timely delivery of projects. In addition, the research highlighted the relevance of strong risk management strategies, especially diversification of suppliers and contingency planning in promoting success in procurement by minimizing disruption of supply and the overall flow of materials.

To summarize, the paper has revealed the significance of taking a holistic look at procurement practice where technological development and the practice of strategic sourcing should be equally important when it comes to the success of procurement. This fact that there is a positive correlation between all these factors implies that by investing in the sustainable sourcing practices, building solid relations with a supplier, and implementing progressive technologies, construction companies will be able to enhance their procurement significantly. Nonetheless, issues of implementation, which are costly and requires qualified individuals to coordinate such strategies, are issues that should be handled to optimize the value that could be delivered by these strategies. As such, in order to foster the successful use of these practices in construction ventures, the research recommends future investment in training, technology and supplier partnership.

5.3. Implications of the Study

The current results of the study have theoretical and management implications to the construction industry. The implications of the theoretical aspects can be seen to be adding to the wider understanding of the knowledge on procurement practices within the construction industry, and the implications of the managerial aspects are more practical suggestions to professionals wishing to promote the success of procurement. In details, the theoretical and managerial implications are discussed below.

5.3.1. Theoretical Implications

The proposed study will make its contribution to the current body of knowledge by enlarging the existing knowledge of the way in which strategic sourcing practices can have direct effects on the success rate of the procurement process during construction initiatives. Although other studies have conducted some research on different procurement practices, there has been limited research on the influence of green sourcing, the use of advanced technologies, supplier relationship management and risk management in the construction industry, all at the same time. The review of the relationships of these factors combined gives the study a more thorough structure of the dynamics of procurement success.

The results address the importance of the practice of green sourcing that remains a popular topic of discussions in the literature on environmental issues and sustainability but has not been well examined in terms of its direct effects on the procurement outcomes in the construction area. This study fills that gap by showing that sustainable measures in sourcing can actually result in superior procurement performance by creating less disruption in the supply chain and having an increased availability in materials.

In addition to that, the research adds to the already expanding body of literature dedicated to the issue of technology in the field of procurement. Possessing advanced technologies like AI and block chain can be viewed as the transformative innovation in the process of procurement, and this paper can present some evidence that could be used empirically in terms of integrating AI and block chain technologies in the procurement strategy. The theoretical contribution is that the current technological innovation has become more than a tool of automating other processes; rather, it is the driver of transparency, efficiency, and performance in a procurement.

Additionally, this study's exploration of supplier relationship management (SRM) adds value to the literature by confirming that strong supplier relationships are crucial to procurement success, particularly in an industry like construction where timely delivery and quality are critical. The research results underline the value of trust and cooperation between suppliers and contractors, so SRM could be a strategic concern to procurement managers.

Finally, the theoretical contribution of the research would also be devoted to risk management practices, which have been already a choice part of the supply chain literature, but remained less commented in the context of construction related procurement success. The study's findings underscore the importance of risk management in procurement, especially through practices like supplier diversification and contingency planning, which have been proven to reduce procurement risks and ensure smoother project delivery.

5.3.2. Managerial Implications

Managerially speaking, this research presents some of the main findings that the perspective of the procurement professionals in the construction industry is based on. To begin with, the findings reveal that

the adoption of green sourcing practices as part of the procurements strategies holds the potential to work wonders in the procurement performance. Managers ought to thus ponder the chances of using more sustainable sourcing, which may include initial increases, but have the virtue of minimizing the risks in the long-term and give competitive advantages in the market. By using the example of green sourcing as an addition, not only can one adhere to the environmental standards, but also positively affect the company image which makes it more appealing to the customers interested in environmental-friendly services.

Second, the paper provides an important contribution by emphasizing the prominent importance of innovative technologies such as AI or block chain in terms of improving the success of the procurement process. The procurement managers need to invest in such technologies to facilitate the process, enhance decision-making and greater transparency and security in transactions with suppliers. Some methods to consider when applying AI include demand forecasting and determining areas of potential supply chain interruption, block chain to secure and transparently track transactions, to ensure ethical procurement of materials and adherence to the contract. Adopting these technologies can make the procurement managers competitive in this more digitalized world.

The study also highlights the need to have proper supplier relationship management. Managers in charge of procurement in construction should ensure that priority is given to long-term relationship with trusted suppliers. This can be done through open communications, contracting, and providing timely payments of good contracts. Such close working relationships with the suppliers can result in better performance, access to materials, and fewer delays, and in fact, it can provide procurement success. This is done to get the managers to consider SRM as a strategic, rather than transactional endeavor.

Lastly, the paper indicates that good risk management is a key to the success of procurement. Managers are advised to implement strong risk management solutions that incorporate aspects such as supplier diversification and having a contingency plan. Such measures have the potential to alleviate the effects of possible disruptions eg. Change in availability of materials, or delays in transportation. Managers should also make their procurement teams prepared to deal with a sudden challenge by reviewing and revising their risk management strategies regularly.

5.4 Limitations of the Study

Although this research paper offers good ideas on how strategic sourcing practices influence the success of procurement when conducting projects in the construction industry, it is not devoid of disadvantages. These weaknesses are notable in the context of interpreting findings, and they will present an avenue to continue research to develop the findings of the current study.

Among the most substantial limitations of the study can be considered the usage of self-report data, collected by the procurement managers and other industry representatives. Although the data to be gathered

will have valuable insights into how procurement in practiced, self-reported data may be subject to bias, including social desirability bias where the respondent may report what they should or think is more socially desirable or what is common in the industry. This has the potential of resulting in over-reporting of green sourcing adoption, advanced technologies, among other long-term strategic practices without the actual practices being a true representation.

The geographic level of the study is another limitation as the geographic scope gives primary attention to the procurement practices in particular regions or countries. Local regulations, cultural practices, and market conditions have a huge impact on the construction industry and they can differ widely between regions. Consequently, the results of this research cannot be completely extrapolated to every region, especially those that are economically different, have other regulatory frameworks or cultural standards. In future, the researchers should expand the research to the range of regions or even countries and thus understanding how practice of this procurement is implemented around the world can be understood.

The other issue is that the only outcome variable the study aims to achieve is procurement success and although this variable is significant it might not represent the fact the various effects of strategic sourcing practices on construction projects. Several other factors can affect the success of the procurement beyond the focus area of this study like project management, financial wellbeing and overall market changes that can affect the procurement. Consequently, due to this there is a possibility that the findings might not reflect the scope of the construction project since most construction projects involve a series of variables that interrelate to dictate overall success. A larger perspective on project success with regard to project completion time, cost overruns and stakeholder satisfaction should be included in future research.

Moreover, the paper focuses more on the direct effect of Green sourcing; advanced technologies, supplier relationship management, and risk management practices factors in relation to the procurement success without considering what variables could be creating moderating effects and others that could be mediating the said variables. As an example, the success of these methods of procurement can be different based on project complexity, size of the construction, the nature of materials involved, etc. In addition, the composition of the procurement team and their expertise can affect the success of strategies. These are other factors that future studies might explore in order to come up with a more detailed interpretation of the role of strategic sourcing practices in promoting procurement success, depending on the context.

Finally, the sample size and composition of the study can hamper the generalizability of the results. Although a high number of procurement professionals were able to take part in the survey, there are prospects that the sample is not be of the entire representation of the type of professionals who work in the construction industry. As an example, the research might be biased to individual professionals belonging in bigger construction companies or even sub-segment of the business, and these might not encompass the

experiences of personnel within smaller businesses or other types of project. Further research might seek to have a broader sample so that the results could be reflective of a broader construction business.

5.5. Recommendations

The conclusions of this research and the limitations allow recommending a number of ideas that can enhance the practices in the field of procurement relationships in the construction industry. These suggestions are geared towards both the improvement of the current practices and the future investigations that can help to build further on the evidence of this work.

5.5.1. For Improvements

Among the recommendations to make, the topic better is the need to improve the implementation of green sourcing policies in construction procurement. Although it has been observed that green sourcing can contribute positively to the procurement success, the concept still has substantial obstacles to its widespread introduction, e.g., the initial cost is high, and the number of available environmentally friendly materials is not very large. The construction companies must aim at forging a long-term relationship with green suppliers and invest in technologies that will facilitating green practices, like using a reduced amount of waste and energy efficient production of materials. In addition, the idea of additional collaboration between the private and the state sector can contribute to propelling the provision of yet more affordable and sustainable materials and therefore, contributing to making the green sourcing practices in construction firms easier to embrace.

To enhance supplier relationship management (SRM), construction companies sought to lay emphasis on forging closer and more productive association with its suppliers. This is done by being more proactive with communications as well as the needs and challenges facing suppliers and the inclusion of the suppliers in the decision-making and planning process. In turn, by doing this, construction companies can perform better considering supplier capabilities, align them, and thus, minimize the chances of having procurement disruptions. Moreover, the implementation of performance-based contracts may motivate the suppliers to perform to the level (or more) that is expected of them, resulting in improved performance, in terms of quality, timeliness and cost-efficiency.

Speaking of the adoption of technology, the construction industry must be ready to consider more advanced technology such as AI and block chain. These technologies have already proven to be used to enhance the effectiveness of the procurement process, reduce risk, and introduce a higher level of transparency. Businesses ought to seek ways of incorporating AI in their procurement decision-making functions including demand-forecasting make-ups using predictive analytics or supplier performance. The block chain can be deployed to provide transparency in transactions and to simplify the handling of contracts and is especially useful when there are too many stakeholders in large construction projects. The training of the

procurement teams should also be done with the aim that the firms can be equipped with appropriate knowledge to use these technologies.

Procurement should always involve practice of risk management such as supplier diversification and contingency planning. Construction firms need to strive to create stronger supply chains by diversifying its supplier list and having contingency plans that would kick in in case anything goes wrong. This can mean finding the backup suppliers or building safety stock on critical supplies to make sure that procurement would not be delayed due to unexpected occurrences. The construction sector ought to become more data-driven in its risk management system, as well, using technology as a way of monitoring potential risks so that it can mitigate them in advance, before they can take a toll on the procurement schedule.

5.5.2. Future Research

There are also some gaps and opportunities that can be suggested so that a future research direction in this area may be attained. To start with, it would be useful to investigate such moderating and mediating factors as can moderate the connection between strategic sourcing practices and procurement success. By way of example, the nature of a project e.g. complexity, the size of the building construction firm or the geographical location of a project might influence the effectiveness of some particular sourcing practices in enhancing the outcomes of a procurement. Comprehension of these contextual factors can also enable more specific recommendations to be made depending on the kind of construction and various organizations.

In addition, more studies are needed to follow the effects of green sourcing and other sustainable purchasing practices beyond the range of procurement results that include cost savings, project quality, and customer satisfaction. This would assist in developing more comprehensive appreciation of long-term advantages of sustainable procurement, other than having material availability and reliable supplies within a chain. Investigating both the environmental and financial advantages and disadvantages of green sourcing would be a valuable experience that construction companies could use in order to find ways of balancing the sustainability objectives with efficient practices at the organizational procurement department.

The research on the role of smaller construction firms in embracing the most advanced technologies like AI and block chain is another source of future research. Smaller firms can be incapacitated by the cost involved in these technologies or lack of technical knowhow despite the ability of larger firms to afford the same. It would be interesting to explore possibilities of smaller firms to embrace and take advantage of such technologies, perhaps with support of off shoring, or adoption of scalable technology. A study on preventing obstacles to the implementation of technological solutions that may challenge construction firms of any employ size would be practical solutions to increasing the application of AI and block chain within the sector.

Lastly, performance based procurement practices in construction as a future concern can also come as a research discussion. With the direction towards increased outcome-based contracts within the industry, it will be beneficial to examine the influence that these practices have not only on the success of the procurement process but also the overall project performance including quality, client satisfaction and long term supplier relations. To improve this instrument and make it applicable in a wider range of situations in the construction industry, it is important to conduct research into the best practices of implementing performance-based procurement in construction projects of different nature.

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