Challenges and Barriers to Implementing Effective Supply Chain Management (SCM) on Manufacturing-Based Projects

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Abstract

The study's specific goal was to evaluate the challenges and barriers to implementing efficient SCM in manufacturing-based projects in Imo state. This research was influenced by the resource-based approach, systems, supply chain collaboration, and lean production and supply chain integration theories. The investigation was conducted using a survey research methodology, with a purposive sampling strategy using the Cochran's method to choose the sample size from a population of manufacturing-based project enterprises in Imo state. To collect data and conduct surveys, a well-structured questionnaire was used, as well as personal observations and trips to manufacturing-based project firms. The collected data was displayed as frequency distribution in tables and figures using IBM SPSS Statistics version 26.0. The primary aims of the study were analysed using exploratory factor analysis. A study of 415 respondents who were involved in manufacturing-based project-related activities revealed that the challenges and barriers to effective SCM implementation in manufacturing-based projects in Imo state Nigeria include: lack of commitment and support by top management, supply chain risk management, resistance of management to change, inventory management, buyer-supplier relationship, resistance of workers to change, organisational barriers, and insufficient This study suggests that crucial solutions include building procurement practices, encouraging collaboration with suppliers, and guaranteeing top management support.

Keywords: *Factor analysis, supply chain management, project management, Imo state, Manufacturing-based projects.*

Introduction

In Nigeria, the manufacturing sector plays a critical role in the country's economic development. Nigeria, being one of Africa's greatest economies, has been heavily interwoven into global supply chains in a variety of industries such as manufacturing, agriculture, and oil and gas. The manufacturing sector makes a considerable contribution to job creation, GDP, and industrial development, making it an important engine of economic transformation. However, the sector confronts numerous hurdles that limit its growth potential, many of which are due to supply chain inefficiencies. Supply chains are becoming more complex as a result of increased product sales, diversified product ranges, improved customer preferences, uncertain demand conditions, the need for collaboration with multiple partners, management of a large number of geographic locations, easy serving, and the introduction of a variety of intermediaries (Sahu, Katyayan, Khandey, Jangde, Sahu, & Sahu, 2023). As a result, a technological push is required to transition organisations from traditional to technology-driven SC management systems on a global scale.

Numerous manufacturing organisations have suffered significant financial losses as a result of environmental fines, energy consumption expenses, and so on (Gupta, Lawal, Orji, & Kusi sarpong, 2023) due to their lack of understanding of the benefits of implementing sustainability (Yadav et al, 2020). As a result, numerous companies have begun to include innovative strategies to address sustainability concerns inside their production operations and supply networks. Manufacturers in Nigeria face ongoing obstacles such as unprocessed raw materials, unpredictable government policies, inadequate infrastructure, and an underskilled workforce. These elements work together to produce a tough operational environment in which supply chain efficacy becomes a major predictor of industrial performance and survival. As a result, the study will investigate the obstacles and impediments to adopting effective Scrum in manufacturing-based projects in Imo state.

The Nigerian manufacturing sector has a high failure rate, which can be attributed to a variety of challenges that manufacturing enterprises face, including financial access constraints, infrastructure deficits, technological progress gaps, market accessibility challenges, and increased competition (Morvey, 2024; Pam, 2026). These issues are frequently worsened by supply chain inefficiencies, which lead to higher operational expenses, delayed deliveries, lower product quality, and an inability to meet market demands (Shaibu & Njoku, 2023).

In Imo State, the relationship between supply chain interruptions and manufacturing business growth has received little attention. Shaibu and Njoku (2023) investigated how supply chain disruptions caused by economic fluctuations and technical innovations boost the growth of manufacturing enterprises in Imo State, revealing a substantial association between these variables. However, further research is needed to determine how comprehensive supply chain management techniques, such as procurement strategies, supplier relationship management, logistics coordination, and technology adoption, influence overall project performance. Furthermore, research on the adoption of digital technologies for supply chain management in Nigeria shows a generally low acceptance rate, with only 39% of small and medium-sized manufacturing firms using digital technology into their supply chain operations (Afolabi, 2024). This technical divide is a major impediment to supply chain optimisation and performance enhancement. While research from other emerging countries (Uwamahoro, Nadeem, Ismail, & Wachiuri, 2024). Morvey (2024) found positive connections between SCM techniques and manufacturing performance; however, the relevance of these findings to the unique conditions of Imo State's manufacturing sector is questionable.

The majority of manufacturing organisations in developing countries employ outmoded production systems and machinery (Maware, Okwu, & Adetunji, 2020). They also lack skilled personnel and scarce resources like as capital, raw materials, water, and energy. This study addresses the issue of a lack of comprehensive empirical evidence on how supply chain management methods affect the performance of manufacturing-based projects in Imo State, Nigeria. Addressing these difficulties is critical for improving project performance, increasing competitiveness, and attaining long-term growth in the manufacturing industry (Pam, 2026). As a result, this study looks into the impact of SCM on manufacturing-based project performance, identifies essential SCM practices, and investigates the challenges that prevent them from being effective. This knowledge gap limits policymakers, industry practitioners, and business owners' capacity to make educated decisions about supply chain investments and improvement methods.

Literature Review

Nigeria's industrial sector faces various issues that impact supply chain management and overall effectiveness. Pam (2026) highlighted numerous problems that contribute to limited economic advantages from global supply chain integration, including unprocessed raw commodities, unstable government policies, inadequate infrastructure, and an underskilled workforce. These variables combine to produce a difficult operating environment in which supply chain efficacy is an important predictor of manufacturing performance and survival.

According to research on strategic procurement in Nigeria's manufacturing sector, many local firms encounter considerable problems in executing effective procurement strategies (Yusuf et al., 2024). These constraints include limited access to financing, infrastructure shortfalls, technical progress gaps, market accessibility issues, and increased competition. The practical implications of research on procurement suggest that by integrating e-procurement and supplier integration, manufacturing firms can adapt more efficiently to changing market conditions, such as daily fluctuations in the cost of raw materials, thereby minimizing supply disruptions and ensuring greater stability in production.

The Nigerian manufacturing industry has also faced obstacles in adopting indigenous inputs. According to recent industry data, while Nigeria has decreased its manufacturing import bill by an estimated 35% as companies develop backward integration, manufacturers are now dealing with greater energy costs, infrastructural shortages, security threats, and quality gaps in local inputs (Pam, 2026). The Manufacturers Association of Nigeria (MAN) has stated that local sourcing and backward integration are critical to long-term competitiveness, particularly in the cement, food, and consumer products industries.

Despite its relevance, adopting SCM in industrial projects is difficult, particularly in underdeveloped nations such as Nigeria. Common impediments include:

Cost and profit allocation

Many organisations face cost and profit allocation difficulties while implementing supply chain management. Because of its increased integration and cooperation, the supply chain threatens to blur company boundaries (Muskoya, 2015). Controlling expenses is critical when raw material prices and shipping costs rise globally. Businesses must tighten cost controls to maintain continuous manufacturing operations and consistent delivery of excellent items at reasonable prices (Khedr & Rani, 2024). Globalisation of supply chains remains a challenge to supply chain management. The drive toward globalisation appears to contradict lean ideals. Muskoya (2015) contends that genuine lean manufacturing requires production facilities to be located closer to customers while keeping transportation links to a minimum.

Natural calamities

Several research studies have looked into the negative effects of natural disasters on the supply chain management of manufacturing companies. Kanike (2023) discovered that natural disasters can create significant supply chain disruptions, such as increased pricing, manufacturing delays, decreased efficiency, and worse customer satisfaction. According to studies, natural disasters such as floods, hurricanes, and other tragedies can substantially disrupt supply chains, making it harder to meet client demands and resulting in fewer sales. The earthquake had a significant influence on the supply chain, resulting in a number of disruptions, including production delays, decreased efficiency, and higher pricing. Furthermore, supply chain interruptions caused by natural disasters

may result in longer lead times and worse customer satisfaction. Disasters can also impair a company's financial standing by increasing unanticipated expenses and making it more difficult to get external finance. Natural disasters can also have an indirect impact, as supply disruptions in one country can affect the entire global supply chain, resulting in output losses and price adjustments. Finally, disasters in developing countries can impede their ability to compete internationally and deter potential foreign investment. According to a study that investigated how the 2011 Tohoku earthquake and tsunami affected Japanese industries, the crisis had a significant impact on the companies' production schedules (Kanike, 2023; Pam, 2026). The authors concluded that substantial supply chain outages caused by natural disasters can result in significant financial losses for businesses. D'Souza, Maguire, and Pitt conducted a 2017 study to explore how an Indian cyclone influenced supply chain management in the automobile industry. The cyclone, according to the authors, interrupted the supply chain, resulting in lower production levels, delayed delivery, and increased costs.

Supply chain risk management

Identifying and mitigating risk is an important part of supply chain management, and a lack of risk management can cause significant disruption in the supply chain process (Alsolami et al., 2025). Natural disasters, economic downturns, and transportation interruptions all pose hazards to supply chains. Risk management and mitigation provide a significant problem for supply chain managers (Khedr & Rani, 2024). Cyber-attacks are becoming more common each year, making it difficult to protect sensitive data and ensure the security of interconnected supply chains (Alsolami et al., 2025).

Unavailability of raw materials

The absence of raw materials severely disrupts supply chain management in industrial enterprises, resulting in significant output and revenue losses (Kanike, 2023). According to a recent survey, the primary difficulty for manufacturing organisations in supply chain management is a lack of raw materials. Raw material scarcity caused manufacturing delays, increased production costs, and difficulty meeting client demands. Insufficient projections, procurement delays, and supply-demand imbalances were also identified as contributing to the raw resource scarcity. Poor resource management poses a key challenge in supply chain management (SCM). Efficient allocation and utilisation of resources such as raw materials, labour, and machinery is crucial for ensuring smooth operations. Resource shortages or mismanagement can cause delays, increased costs, and operational inefficiencies, all of which have an impact on the supply chain's overall performance. According to Kanike (2023), supply chain disruption caused by a scarcity of raw materials and parts led to manufacturing delays and decreased output volumes. The inquiry also discovered that inadequate risk management approaches, limited production capacity, and late deliveries were the primary causes of the raw material shortfall.

Changes in regulations

Rapid regulatory advancements in the manufacturing industry have disrupted traditional supply chain models, posing considerable challenges for supply chain management. Changes in rules can cause significant disruptions in supply chain management in the manufacturing business. For example, various automotive-related rules may have an impact on the supply chain. These guidelines specify safety standards, country of origin labelling, and emission standards (Kanike,

2023). Regulatory changes may affect the food industry's supply chain. For example, the Food Safety Modernisation Act (FSMA) of 2011 raised the standards for food manufacturing and distribution safety laws. Changes in rules can have a variety of effects on the supply chain. As a result of the increased regulations, the production technique may need to be adjusted, potentially increasing prices, causing delays, and disrupting the supply chain. In some cases, the new regulations may require the addition of new suppliers or changes to current ones in order to meet the new standards.

Buyers and providers are concerned about how government involvement would affect resource scarcity. Goh (2001) identified two sorts of regulatory mechanisms: (1) exclusive property rights provided by the state or another actor acting under state authority, and (2) various forms of first mover advantage. As a result of its authority to issue and control property rights, the state may plainly play a key role in establishing and maintaining circumstances of resource scarcity. This shortage may result in an unfair, suboptimal power advantage for a buyer or provider. Such innovative or disruptive laws can either benefit or harm an otherwise efficient supply chain. A study looked into how legislative changes affected supply chain management in the automobile and aerospace industries. According to a study (Kanike, 2023), legislative changes harm supply chain management since they delay part manufacturing and delivery, increase operational costs, and impede information flow. The survey also concluded that frequent legislative changes present a significant obstacle to businesses managing their supply chains efficiently. In this situation, regulation simply requires adherence to basic standards, which restricts new SCM processes or limits proactive conduct (Oelze, 2017). Furthermore, price-conscious purchasing decisions and a lack of demand for sustainable products are customer-related concerns.

Lack of dedication and support from senior management

First and foremost, people-related concerns have been identified as internal hurdles to SCM deployment. Obstacles identified include a lack of commitment and support from top management, a lack of awareness and understanding, and other competing priorities (Oelze, 2017). The SMEs' initiative is hampered by a lack of management commitment and an incorrect understanding of the time and resources required to implement Six Sigma (Antony, Kumar, & Labib, 2008).

Transportation issues

Disruptions to the transportation process, which is a critical component of the supply chain, can have a significant impact on supply chain management in the manufacturing industries. Rising fuel prices, stricter regulations, and increased competition in the logistics industry have all contributed to an increase in recent years in the focus on transport issues as a disruption to supply chain management. Numerous studies have been conducted to investigate the impact of transportation disruptions on supply chain management in manufacturing industries. According to Kanike (2023), transportation-related supply chain disruptions were a major source of problems in the United States' automotive industry. Several factors contributed to the delays, including poor supply chain partner coordination, limited transportation capacity, and inadequate road infrastructure. According to the study, improved infrastructure and increased communication among supply chain stakeholders could result in fewer and less severe supply chain disruptions due to transportation issues. A study of the US agricultural industry was conducted in 2018 (Pam, 2026). The study reiterated that transportation issues accounted for the majority of supply chain disruptions. According to the report, issues such as insufficient transportation capacity, ineffective routes, and

delivery delays had a significant impact on the supply chains. The study also discovered that improved infrastructure, route optimisation, and collaboration among supply chain partners could reduce the frequency and severity of supply chain disruptions caused by transportation issues.

Lack of accountability

According to Maramura and Ruwanika (2023), social accountability is the wide-ranging activities and instruments outside voting, which citizens can undertake to hold the Government to account, and activities on the part of Government, action groups, media, and other social players that sponsor or enable these effects. Maramura and Ruwanika (2023) argued that non-payment of service providers, are among many areas of weaknesses, including political interferences during administering of tenders, below standard valuations of criteria and uneven tender practices. Accountancy firms may not have the necessary competences to detect all matters related to working conditions (Szegedi & Kerekes, 2012). The audit methodologies can also contribute to a failure to determine the true working conditions. Monitoring and auditing have a relatively minor actual impact on or benefit to workers and other stakeholders (Szegedi & Kerekes, 2012). The Auditor General of South Africa (2019) condemns this on lack of preparation, insufficient procedures, shortage of reliable reporting and accountability and insufficient monitoring by all role players engaged with the SCM process. In the Consolidated General Report on Local Government audit outcomes (2018–19), the AGSA states that there is lack of oversight over public money, which leads to weak accountability and resultant experience to mishandling of public money of which fiscal maladministration and ethical transgression cannot be excepted Maramura and Ruwanika (2023). Corrupt procedures limited to procurement dealings include corruption, coercion, theft, favouritism, patronage practices and dishonesty.

Corruption and non-compliance- to rules, regulations and policies

From a supply chain management perspective, it is vital to understand the impact of government regulations on players in the supply chain. Restrictive laws and regulations can create artificial resource scarcity (Goh, 2001). According to Maramura and Ruwanika (2023) fraud and corruption involved in unethical conduct, cost the South Africa (SA) Government sizable sums of income yearly, as fruitless, and wasteful expenditure. They further argue that in 2014, for example in the SA Government paid around R26, 4 billion in aspects that breached rules and policies, as well as corruption. In addition, the lack of a skilled SCM staff is exacerbating the situation, which continues to be one of the major restrictions to the growth of business functions in SA. Moreover, ineffective monitoring and evaluation, the lack of adherence to current policies, lack of preparation and too much decentralisation of the procurement method are among the many challenges facing public sector SCM. Maramura and Ruwanika (2023) further substantiate this by stating that the previously compromised SCM and procurement systems are further weakened, because of an apparent need of organisation, insufficient distribution of knowledge and poor record-keeping. These are the foundations that led government officials to be beneficiaries of donations and benefits that they were not eligible to, due to the absence of incorporation, certification and sharing data realities. These disparities and vulnerabilities led to SCM legislation being put on the side, clear indications of overpricing, fraudulent procedures, and possible dishonesty.

Inventory management

Inventory Management is a balancing factor to meet customer requirements by decreasing raw material holding costs, and it is a tough task (Alsolami et al., 2025). Effective inventory management is a crucial one to balance supply and demand. Optimal inventory level maintenance is a hard one for coping with varied items or seasonal demand swings. Companies strike the balance between inventories to fulfil consumer demand with minimum holding costs (Khedr & Rani, 2024).

Organizational barriers

Organizational barriers are still the emphasis of engineering managers in improving sustainability in the industrial industry. Previous study works revealed Inefficient technology comprises the underperformance of present technology to improve sustainability in the sector (Gupta et al., 2023). Insufficient commitment of top management refers to the inadequate assistance of high-ranking executives in the industry to implement sustainability. Financial restrictions are related with a shortage of available cash and budget to actualize sustainable aims in the industry. Lack of skilled labour refers to unskilled labour or personnel without the essential skills to adopt sustainability in the sector. Absence of a globalized network relates to an unintegrated system of operations and activities connected with achieving sustainability in the industry.

Socio-cultural Barriers and Differences

Furthermore, cultural differences may limit the implementation of SCM practices (Oelze 2017). Suppliers, in particular, view environmental and social norms as additional expenditures and interventions in their business operations. To provide insight into socio-cultural barriers, six criteria are used: lack of social responsibility, reluctant behaviour toward sustainability, ineffective communication, low market growth potential, lack of respect for policy, and lack of adequate government regulations (Gupta et al., 2023). Absent corporate social responsibility refers to the lack of pressure from the public, non-governmental organisations, and the media to achieve sustainable goals. Reluctant behaviour toward sustainability refers to a lack of interest in sustainable products and creative ways caused by a lack of information about the benefits of sustainability and a negative green brand image (Gupta et al., 2023). The term "poor market growth potential" refers to the low output volume that the industrial product market is predicted to reach as a result of low awareness and population increase. Ineffective communication is related with the difficulty or obstacle of successfully conveying information within the sector. Non-compliance with policies refers to the ineffective creation and execution of sustainability policies in the industry. Inadequate government legislation and regulations refers to the absence of appropriate government environmental laws and policies to promote the implementation of sustainability.

Geographical obstacles.

Although geographical barriers present obstacles in adopting sustainability, they are rarely considered due to their complexity (Gupta et al., 2023). To have a thorough grasp of geographical characteristics, four criteria are proposed: adverse climatic circumstances, terrain, shortage of natural resources, and political instability (Gupta et al., 2023). Unfavourable climatic conditions are unpleasant and physically uncomfortable weather conditions that function as a hindrance to implementing policy objectives for sustainability goals. Unsustainable landscape refers to scenery that is unresponsive to the environment and creates a hurdle to achieving sustainability. Scarcity

of natural resources refers to the absence of naturally existing substances or environmental features. Political instability is defined as the failure of a government regime to maintain integrity and durability.

Empirical review

The study's conclusions are useful for firm managers who want to apply SCM in a multicultural setting like Malaysia. It is up to these managers to exercise caution when building a strategic strategy for effective SCM deployment, as well as when designing programs to overcome SCM hurdles. Maramura and Ruwanika (2023) conducted research on identifying obstacles in SCM using information from Mangaung Metropolitan Municipality. The study sought to evaluate the problems of supply chain management that affect service delivery in the Mangaung Metropolitan Municipality (MMM). The study used a qualitative design. Semi-structured interviews were conducted, and the data was examined thematically. One of the study's results is that the SCM department cannot function well in the presence of instability, lack of integrity, lack of human capacity, lack of skills, supplier nonpayment, political intervention, corruption, and a lack of responsibility. To ensure effective and efficient service delivery, the supply chain management system should transition from paper to electronic. Public officials should be able to interpret the laws, rules, regulations, and policies that regulate SCM. The study concluded that in order to improve service delivery, supply chain management professionals with the necessary capacity and skills should be hired. The report also advised that internal controls in all aspects of supply chain management be enhanced, that regulations be amended to allow for faster procurement of goods and services.

Kanike (2023) conducted research on factors that disrupt supply chain management in industrial businesses. The study seeks to investigate the reasons of supply chain management disruptions in the manufacturing industry. Supply chain disruptions have emerged as a major problem for businesses worldwide, posing considerable threats to business operations, expenses, earnings, and customer satisfaction. Natural disasters, raw material scarcity, regulatory changes, technology breakdowns, labour shortages, transportation challenges, and political instability were among the factors investigated in the research. The analysis included publications and research papers that shed light on the reasons of interruptions in manufacturing supply chains. The findings underline the necessity of proactive efforts in developing resilient supply chains that can successfully handle disturbances. These strategies include putting in place strong risk management policies, making smart technological investments, and fostering collaborative partnerships with customers and suppliers. Manufacturing organisations can improve the resilience of their supply chains and assure ongoing operations by taking these steps. Finally, the study emphasised the crucial relevance of resolving supply chain disruptions in the manufacturing sector, arguing for a proactive and comprehensive approach to reducing their impact. Effective risk management techniques, technological investments, and strong relationships are critical for increasing supply chain resilience and mitigating the negative effects of disruptions.

Maware and Parsley II (2022) investigated the problems of lean transformation and implementation in the manufacturing industry. The study's authors investigated the challenges of lean transformation and implementation in the manufacturing industry. Using survey data from 50 North American manufacturing organisations, they investigated the obstacles of introducing and maintaining lean manufacturing concepts and practices in production processes. The fuzzy analytic hierarchy process (FAHP) and fuzzy analytic network process (FANP) were used to rank the

significant issues encountered in these organisations. They determined that the most significant impediment to Lean implementation was a shift in organisational culture. It is difficult to maintain Lean without a cultural transformation and a clear direction established by the organization's leadership team. The paper's novelty stems from its emphasis on organisational culture as a fundamental obstacle to lean manufacturing deployment. Other problems found during Lean implementation in the manufacturing industries were managerial support, technical understanding, and employee resistance to change. Early identification of these difficulties allows businesses to evaluate their capabilities prior to applying the Lean mindset. In this study, the researchers examined data from 50 manufacturing enterprises in North America, which represented a subset of manufacturing organisations. As a result, it must be interpreted using the data collection method and the study's sample size.

Gupta et al. (2023) conducted research on closing the gap: The role of distributed manufacturing systems in overcoming challenges to manufacturing sustainability. The study suggested a technique for determining the relative relevance of sustainability obstacles, the impact of Distributed Manufacturing Systems (DMS) on these barriers, and the link between DMS features and sustainable performance. Drawing on a large data set from the Chinese manufacturing industry, the Best Worst Method (BWM) is utilised to study the relative relevance of sustainability barriers and how DMS qualities influence these barriers and connect to sustainability. The study's findings revealed that 'organisational obstacles' are the most severe impediments, with'reduced carbon emissions' having the most influence on 'organisational' and'socio-cultural barriers,' while 'public approval' has the greatest impact on 'organisational barriers. According to the findings, the DMS approach of "reduction of carbon emissions" is closely associated to increased long-term performance. As a result, the findings can provide detailed information to decision-makers, practitioners, and regulatory agencies about the importance of the barriers and the impact of DMS qualities on sustainability barriers, as well as how to improve sustainable performance for increased global competitiveness. Furthermore, our findings provide a solid framework for future research into the relationship between DMS and sustainable performance.

Methodology

The study used a descriptive survey research design, which is suited for assessing the present state of supply chain management techniques, project performance, and implementation issues in the manufacturing sector. The first part consists of a cross-sectional study of manufacturing companies in Imo State. This strategy allows for the collecting of qualitative and quantitative data from a specific population in order to describe and investigate existing linkages. The target audience consists of supply chain specialists, project managers, procurement officials, warehouse managers, and operations people working on manufacturing-related projects in Imo state, Nigeria. These responders are directly involved in SCM-related functions that impact project outcomes. Furthermore, this study's target audience includes several manufacturing businesses in Imo State, Nigeria (Uwamahoro et al., 2024). According to available sources, Imo State's manufacturing industry includes firms in a variety of subsectors, including food processing, plastics and packaging, pharmaceuticals, building materials, and consumer products manufacture. The study used a combination of purposive and snowball sampling. Purposive sampling was initially utilised to find manufacturing businesses in Imo State by searching accessible directories, business associations (such as the Manufacturers Association of Nigeria, Imo State Chapter), and government documents. Purposive sampling was then used to obtain additional respondents via

referrals from initial contacts. Given the absence of a complete sample framework for Imo State's manufacturing companies, this combined sampling strategy seemed acceptable. It has been effectively used in comparable research around the region. Ogbede, Ihemeje, and Ikoro (2025) investigated SMEs in Imo State using a sample selected from all 27 Local Government Areas, demonstrating the applicability of this methodology. The determination of an appropriate sample size is critical for assuring the statistical power and generalisability of the study findings. Given the absence of a complete and up-to-date record of all manufacturing companies in Imo State, the sample size was calculated using recognised formulas for unknown population estimates. To calculate sample size, use the Cochran formula: $n = Z^2 \times p \times (1-p) / e^2$. Here, Z represents the desired confidence level (1.96 for 95% confidence), p is the estimated proportion of the population (0.5 for maximum variability), and e is the desired margin of error (0.05 for 5%).

Therefore, $n = (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2$, $n = 3.8416 \times 0.25 / 0.0025$; $n = 384.16 \approx 385$.

To adjust for non-response and incomplete questionnaires, the sample size was increased by 20%, yielding a target sample of around 462 respondents. This technique is consistent with previous research in the Nigerian manufacturing sector. Popoola and Olapoju (2025) gathered 100 questionnaires for exploratory factor analysis in Nigerian manufacturing enterprises, whereas Nwaobia et al. (2025) distributed questionnaires to 255 respondents in Nigerian manufacturing firms, resulting in an 80% response rate. The data gathering instruments are structured questionnaires. The structured questionnaire was designed to gather quantitative information about supply chain management techniques and manufacturing project performance. The questionnaire was organised into sections. The other portion discusses the obstacles and barriers to supply chain management and manufacturing-based project firms. All items were rated on a five-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The Likert scale format is extensively used in supply chain management research, and it has been verified in Nigeria (Popoola & Olapoju, 2025; Nwaobia et al., 2025).

The survey instrument was reviewed by an expert to determine its content validity. Three academic specialists in supply chain management and operations management assessed the questionnaire, as did three industry practitioners with substantial expertise in manufacturing and supply chain operations. Their comments was incorporated to ensure that the instrument sufficiently covers the constructions being studied (Popoola & Olapoju, 2025). Data was collected over a three-week period. Questionnaires were sent both physically and electronically. Respondents were given clear instructions and a one-week response window, with reminders to follow up.

The acquired data was analysed with the Statistical Package for Social Sciences (SPSS) and Microsoft Excel for data organization and visualisation. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarise respondents' demographic attributes and replies to survey questions. Then, exploratory factor analysis (EFA) was used to confirm the underlying structure of the measurement scales and identify the essential characteristics of supply chain management techniques in the Imo State manufacturing setting. Popoola and Olapoju (2025) illustrated the use of EFA in Nigerian industrial research. The quantitative data was analysed with SPSS version 27. This method is similar to that used by Nwaobia et al. (2025) and Ho, Nguyen, and Nguyen-Phuong (2025) in their supply chain management studies.

Results and discussions

The factor analytical approach to the challenges and barriers to supply chain management implementation are presented in tables 1 to 3.

Table 1: KMO and Bartlett's Test for challenges and barriers to SCM implementation

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.618
Bartlett's Test of Sphericity	Approx. Chi-Square	5636.657
	Df	253
	Sig.	.000

IBM SPSS Statistics version 25.0 was used to conduct principal component analysis on twenty-three (23) items representing the obstacles and constraints to effective SCM adoption in manufacturing-based projects in Imo state. Previously, the suitability of data for analysis was determined. An examination of the correlation matrix revealed that many of the coefficients had values of 0.5 or above. The Kaiser-Meyer-Olkin (KMO) sampling adequacy score of 0.618 was obtained. This number falls within the desired range of 0.6. According to the table above, Bartlett's test of sphericity was 5636.657, with a corresponding significance of 0.000, indicating an appropriate level of internal consistency and reliability in the measures and scale.

Table 2: Communalities for challenges and barriers to SCM implementation

Communalities		
	Initial	Extraction
Lack of commitment and support by the top management	1.000	.584
Socio-cultural barriers/differences	1.000	.592
Geographical barriers	1.000	.654
Supply chain risk management	1.000	.602
Cultural barriers/differences	1.000	.656
Resistance of management to change	1.000	.589
Transportation issues	1.000	.533
Lack of accountability	1.000	.531
Inventory management	1.000	.674
Technology breakdown	1.000	.603
Labour shortage	1.000	.868
Buyer-supplier relationship	1.000	.875
Political instability	1.000	.853
Resistance of workers to change	1.000	.852
Cost and profit allocation	1.000	.851
Natural disasters	1.000	.506
Unavailability of raw materials	1.000	.583
Changes in regulations	1.000	.681

Corruption and non-compliance- to rules, regulations and policies	1.000	.531
Organizational barriers	1.000	.556
Complexity in implementing lean manufacturing	1.000	.614
Lack of coordination between different transportation and logistics authorities/transportation issues	1.000	.624
Insufficient financial resources	1.000	.567
Extraction Method: Principal Component Analysis.		

From the table above, the variable with highest communality was associated with buyer-supplier relationship (0.875), while that of the lowest was associated with the variable natural disasters (0.506). Hence, the communalities extracted support the use of factor analysis on the variables. It can be observed that no item had extracted eigenvalues less than the 0.50 cut-off point, even though some had up to 1.0 cut-off point, hence indicating that all the variables are qualified for further analysis.

Table 3: Total Variance Explained for challenges and barriers to SCM implementation

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.440	14.959	14.959	3.440	14.959	14.959
2	2.238	9.729	24.687	2.238	9.729	24.687
3	1.994	8.669	33.356	1.994	8.669	33.356
4	1.565	6.805	40.161	1.565	6.805	40.161
5	1.360	5.911	46.072	1.360	5.911	46.072
6	1.189	5.171	51.243	1.189	5.171	51.243
7	1.075	4.675	55.918	1.075	4.675	55.918
8	1.017	4.420	60.338	1.017	4.420	60.338
9	.993	4.316	64.654			
10	.934	4.059	68.713			
11	.864	3.755	72.469			
12	.808	3.513	75.982			
13	.758	3.294	79.276			
14	.714	3.105	82.381			
15	.693	3.015	85.396			
16	.609	2.649	88.044			
17	.568	2.472	90.516			
18	.535	2.328	92.844			
19	.517	2.247	95.091			
20	.406	1.767	96.858			
21	.331	1.440	98.298			
22	.259	1.127	99.425			
23	.132	.575	100.000			
Extraction Method: Principal Component Analysis.						

The results reported in table 3 above yielded an eight-factor component solution that explained 60.338% of the variance. The first component accounted for 14.959% of the variation, the second for 9.729%, the third for 8.669%, and the eighth for 4.420%. The overall variance explained exceeds the necessary minimum of 50%. The eight components were named after the factor with the largest load in the cluster. These are covered in greater detail in the discussion section. The component matrix results suggest that 23 elements may be classified into eight (8) decision matrix (components) of problems and impediments to SCM deployment. However, eight principal components (factors) were later identified as effective. In the first component, three (3) elements contribute favourably to order loads: lack of commitment and support from top management, socio-cultural hurdles/differences, and geographical constraints. The findings of this study agreed with those of Antony et al. (2008), who believed that SMEs' initiative and similar initiatives such as SCM in manufacturing outfits are hampered by a lack of management commitment and a misinterpretation of the time and resources required for Six Sigma implementation. The second component had two (2) elements with the highest positive loading: supply chain risk management and cultural barriers/differences. This conclusion supports Alsolam et al.'s (2025) opinion that recognising and reducing risk is an important part of supply chain management, and a lack of risk management can result in severe disruptions in the supply chain. Three (3) elements were the most positively loaded in the third component. The factors include management's opposition to change, transportation challenges, and a lack of responsibility. In the fourth component, three (3) elements were loaded positively and maximally. Inventory management, technological malfunction, and a manpower scarcity are among the issues. The fifth component had two (2) factors loaded. They include the buyer-supplier relationship and political instability. In the sixth component, six (6) factors were loaded maximally. They include workers' resistance to change, cost and profit allocation, natural disasters, raw material shortages, regulatory changes, corruption, and noncompliance with laws, regulations, and policies. In the seventh component, three (3) elements were loaded maximally: organisational hurdles, complexity in adopting lean manufacturing, and a lack of coordination between various transportation and logistics authorities/transportation concerns. One (1) factor loaded maximally in the eight components, which included insufficient financial resources. According to the findings, the components that emerged could be the primary underlying problems and hurdles to SCM adoption in Imo state.

Conclusion

Respondents provided four hundred and fifteen (415) replies on the obstacles and constraints to effective SCM adoption in manufacturing-based projects in Imo state. The study's findings suggest that the twenty-three (23) key obstacles and barriers to efficient SCM implementation in manufacturing-based projects may be classified into eight (8) decision matrix (component) challenges and barriers. However, the 8-principal components were eventually identified as the most critical hurdles and barriers to successful SCM adoption in manufacturing-based initiatives. The following challenges and barriers are among the most significant: a lack of commitment and support from top management, supply chain risk management, management resistance to change, inventory management, buyer-supplier relationships, worker resistance to change, organisational barriers, and inadequate financial resources. The ideas significantly increase the performance of supply chain management in manufacturing operations in Imo State, Nigeria. Success requires top-level commitment and enough resources, effective change management, and coordination across organisational functions and supply chain partners. The guidelines are broad, but manufacturing

organisations must adjust them to their specific circumstances, capacities, and priorities. To ensure long-term development, a progressive implementation strategy is proposed, beginning with the most urgent proposals. Finally, the answers to these difficulties would assist manufacturing enterprises gain the greatest benefits of SCM, thus boosting project performance, competitiveness, and economic development in Imo State.

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