AN ANALYSIS OF THE IMPACT OF PROCUREMENT AND COMMUNICATION MANAGEMENT ON THE PERFORMANCE OF CONSTRUCTION PROJECTS IN NIGERIA

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Article history
Received
30th August 2023
Revised
24th October 2023
Accepted
25th October 2023
Published
17th June 2024

ABSTRACT

The construction sector plays a vital role in driving economic growth and development in Nigeria. However, it faces significant challenges, particularly in project performance, which can be attributed, at least in part, to ineffective communication and procurement management. This research aims to evaluate how communication and procurement management impact the outcomes of construction projects in Nigeria. To conduct this study, a quantitative research design was employed, utilizing a survey questionnaire administered to 260 construction professionals. The data collected underwent analysis employing various techniques such as descriptive statistics, confirmatory factor analyses (CFA), exploratory factor analyses (EFA), and structural equation model (SEM) utilizing software including the Statistical Package for Social Sciences (SPSS), Microsoft Excel, and LISREL (Linear Structural Relations). The SEM analysis results revealed that 31 out of the 35 hypotheses used in the study were validated. Among these, the strongest relationships observed were those between procurement management and time performance, procurement management and cost performance, time performance and cost performance, time performance and quality performance, and communication management and time performance, in that specific order. This demonstrates the critical role of effective communication and procurement management in achieving successful construction projects in Nigeria. Additionally, the analysis of factors affecting the implementation of procurement and communication management in the Nigerian construction industry highlighted the need for stakeholders to be proactive in developing strategies that facilitate effective implementation of these practices to enhance project performance. The study also emphasizes the importance of establishing effective procurement policies and regulations, embracing technology, building capacity, managing stakeholders, and continuously improving project management practices to elevate project performance in the Nigerian construction industry.

Keywords: *Communication, Procurement Management, Project Performance, Construction Industry, Nigeria.*

1. INTRODUCTION

The construction industry in Nigeria is a vital sector that contributes significantly to the country's Gross Domestic Product (GDP) (Oladapo et al. 2018, Unegbu et al. 2023). The industry encompasses various aspects of infrastructure development, including residential and commercial buildings, roads, bridges, and other public facilities. However, the sector has been facing several challenges that have impacted its growth and development. One of the major issues facing the Nigerian construction industry is delays in project completion, which can lead to cost overruns and poor quality (Aibinu & Jagboro,, 2002). These delays have been attributed to various factors, including inadequate communication and poor procurement management practices. In particular, ineffective communication channels between project stakeholders, including clients, contractors, and subcontractors, can lead to misunderstandings and

delays in project execution (Oladapo et al.,2018). Similarly, poor procurement practices such as bid rigging and inadequate evaluation of bids can result in the selection of unqualified contractors, leading to delays and cost overruns (Oyewobi & Ogunsemi, 2015).

Insufficient communication among project team members can result in misunderstandings, misinterpretations, and conflicts, leading to delays, cost overruns, and rework (Abidoye et al., 2018). Moreover, it has encountered significant challenges in procurement, including lack of transparency, corruption, and inadequate planning and management (Ogunsemi et al., 2016). Ineffective procurement practices can result in cost overruns, delays, and poor work quality, negatively impacting project performance. Several studies have explored the relationship between communication and project performance in construction projects. Gbadamosi et al. (2020) discovered that effective communication among project team members has a positive impact on project performance in the Nigerian construction industry. Similarly, a study by Abidoye et al. (2018) revealed that communication breakdown is a major cause of delays in construction projects in Nigeria.

Procurement management has also been identified as a critical success factor for construction projects (Ogunsemi et al., 2016). Effective procurement management can lead to cost savings, improved quality, and timely delivery of materials and services required for a project. However, the Nigerian construction industry has been grappling with significant procurement challenges, including lack of transparency, corruption, and inadequate planning and management (Ogunsemi et al., 2016). These challenges can adversely affect project performance, resulting in cost overruns, delays, and poor work quality. To address these challenges, a comprehensive study is necessary to examine the impact of communication and procurement management on the performance of construction projects in Nigeria. Despite the importance of communication and procurement management, there is limited research on their impact on project performance in Nigeria. This research gap highlights the need for a comprehensive study to understand the relationship between communication, procurement management, and project performance in Nigeria. This study will offer insights into the critical factors influencing project performance and can aid in enhancing project management practices in the Nigerian construction industry. Additionally, it will provide evidence-based recommendations for improving communication and procurement management practices in the Nigerian construction industry.

This study holds significance in several aspects. Firstly, it will contribute to existing knowledge by shedding light on the impact of communication and procurement management on the performance of construction projects in Nigeria. The findings will offer insights into critical factors that influence project performance and can guide the improvement of project management practices in the Nigerian construction industry. Secondly, the study will present a framework for effective communication and procurement management in construction projects in Nigeria. This framework can be utilized by project managers, contractors, and other stakeholders involved in construction projects to enhance project outcomes. Thirdly, evidence-based recommendations for improving communication and procurement management practices in the Nigerian construction industry will be provided. These recommendations can be utilized by policymakers, industry associations, and other stakeholders to enhance the overall performance of the construction industry. Finally, the study will serve as a valuable resource for future research on project management practices in the Nigerian construction industry, providing a basis for further investigation into critical success factors influencing project performance in the construction industry.

2. MANAGEMENT

2.1 Communication Management

Communication management is an essential aspect of organizational success. Effective communication enhances collaboration and coordination among different stakeholders, including employees, customers, suppliers, and partners. According to Naveed, Ali, and Hussain (2016), communication management involves the planning, implementation, monitoring, and evaluation of communication activities in an organization. The process entails understanding the communication needs of different stakeholders, developing a communication strategy, selecting appropriate channels and tools, creating and disseminating messages, and measuring the effectiveness of communication efforts. Effective

communication management requires a comprehensive understanding of the communication process, the cultural and social context, and the characteristics of the audience. The use of technology and social media platforms has also expanded the scope of communication management, creating opportunities for new communication channels and approaches.

The role of communication management in organizational performance has been extensively studied in literature. Scholars have shown that effective communication management leads to higher levels of employee satisfaction, engagement, and commitment, which are critical drivers of productivity and innovation (Harris & Nelson, 2016). Additionally, good communication practices contribute to better decision-making, problem-solving, and conflict resolution, as well as enhanced customer relationships and brand reputation (Cornelissen, 2014). Moreover, communication management is essential for creating a positive organizational culture, characterized by open communication, trust, and transparency. In conclusion, communication management is a critical aspect of organizational success. By adopting effective communication strategies and practices, organizations can improve their performance, enhance stakeholder relationships, and achieve their objectives.

Communication is a critical success factor in construction projects, as it plays a significant role in ensuring project success (Gbadamosi et al., 2020). Effective communication among project team members can lead to better decision-making, improved coordination, and faster problem resolution (Abidoye et al., 2018). In contrast, poor communication can lead to misunderstandings, misinterpretations, and conflicts, resulting in delays, cost overruns, and rework (Abidoye et al., 2018). Construction projects require effective communication among various stakeholders, including the client, project manager, contractors, subcontractors, suppliers, and other team members. The main communication channels used in construction projects include face-to-face communication, meetings, written communication, and electronic communication (Abidoye et al., 2018).

Face-to-face communication is considered the most effective communication channel, as it allows for personal interaction and immediate feedback (Gbadamosi et al., 2020). Meetings are another important communication channel, as they provide an opportunity for project team members to discuss project issues and resolve problems (Abidoye et al., 2018). Written communication, such as reports, memos, and emails, is another essential communication channel used in construction projects. Written communication provides a formal record of project decisions, actions, and outcomes (Abidoye et al., 2018). Finally, electronic communication, such as text messages, video conferencing, and social media, is becoming increasingly popular in construction projects, as it allows for instant communication regardless of location and time (Gbadamosi et al., 2020).

The Project Management Institute (PMI) has created a communication management framework that offers a structured approach for handling communication in projects (PMI, 2017). This framework comprises four distinct processes: planning communication management, managing communication, monitoring communication, and controlling communication. The planning communication management process entails creating a communication plan that outlines the project's communication goals, stakeholders, and channels. The managing communication process involves distributing information to stakeholders through the designated communication channels stated in the communication plan. The monitoring communication process involves keeping track of and reporting on the effectiveness of communication, while the controlling communication process involves making adjustments to the communication plan based on feedback received from stakeholders.

2.2 Procurement Management

Procurement management is an important aspect of the construction industry, involving the planning and execution of the acquisition of goods, services, and works required for the successful completion of a construction project. It encompasses the process of identifying needs, evaluating potential suppliers, negotiating contracts, and monitoring performance. This script focuses on procurement management in the construction industry, exploring the challenges, strategies, and best practices involved.

Procurement management in the construction industry is faced with several challenges. One major challenge is the complexity of the supply chain, which involves numerous tiers of suppliers, each with their own unique requirements and constraints. This complexity can lead to delays, inefficiencies, and increased costs, making it difficult to manage procurement effectively (Zhang et al., 2017). Another challenge is the need to balance cost, quality, and time in the procurement process. While cost is a

critical factor, it should not be prioritized at the expense of quality or timeliness. Balancing these factors requires effective communication and collaboration between the procurement team and other stakeholders, such as project managers, architects, and contractors (Sakalayen et al., 2019).

Effective procurement management requires the implementation of several strategies. One strategy is to develop a comprehensive procurement plan that outlines the project's procurement requirements, timelines, and budget. The plan should also identify potential risks and strategies to mitigate them (Kamruzzaman et al., 2020). Another strategy is to use technology to streamline the procurement process. For instance, electronic procurement systems can automate processes such as bid evaluation, supplier selection, and contract management, reducing the time and resources required for procurement (Abdullah et al., 2020).

In order to ensure successful procurement management in the construction industry, several best practices should be adopted. One best practice is to engage in early procurement planning, which involves identifying procurement needs and requirements before the start of the project. Early planning can help to reduce procurement costs, improve quality, and increase the efficiency of the procurement process (Sohail and Cavill, 2017). Another best practice is to implement a robust risk management plan. This involves identifying potential risks in the procurement process and developing strategies to mitigate them. For instance, risks such as supplier bankruptcy, delivery delays, and quality issues should be identified and addressed in the procurement plan (Wang et al., 2019).

The PMI has established a structured approach, known as the procurement management framework, to effectively manage procurement within projects (PMI, 2017). This framework comprises four distinct processes: planning procurement management, executing procurement, overseeing procurement, and finalizing procurement. During the planning phase, a procurement management plan is created, outlining the project's procurement objectives, strategy, and necessary documents. The execution phase involves soliciting quotations, bids, or proposals from suppliers and selecting the most suitable one to provide the required goods and services. In the oversight phase, the procurement contract is managed to ensure that the supplier meets the project's specifications. Lastly, in the finalization phase, the procurement contract is closed and all deliverables are verified for completion.

2.3 Relationship between communication and procurement management and project performance

Studies have shown that communication breakdown is a significant cause of delays, cost overruns, and poor quality of work in construction projects (Abidoye et al., 2018). Effective communication among project team members can lead to improved coordination, reduced misunderstandings, and faster decision-making, resulting in timely delivery and improved project performance (Gbadamosi et al., 2020). Communication between the client and the contractor is also essential in ensuring that project requirements are understood and met, leading to improved quality and customer satisfaction. Procurement management has also been identified as a critical success factor in construction projects. Effective procurement management can lead to cost savings, timely delivery of materials and services, and improved quality (Ogunsemi et al., 2016). Ineffective procurement management can lead to delays, cost overruns, and poor quality of work, negatively impacting project performance. Adequate procurement planning, selection of suitable suppliers, and effective contract management are essential for successful procurement management.

The relationship between communication and procurement management is also crucial in achieving project success. Effective communication is required for effective procurement management, ensuring that suppliers are selected based on project requirements and that contract terms are understood by all parties. Additionally, effective communication is essential in managing the procurement process, ensuring that materials and services are delivered on time and to the required quality. Numerous investigations have explored how communication and procurement management affect project outcomes within the construction sector. For instance, Liu et al. (2021) conducted a study which discovered that proficient communication among team members had a substantial impact on project success. The study emphasized that enhanced coordination and decision-making resulted in improved project performance. Additionally, the research highlighted the significance of efficient procurement management in achieving successful project delivery. Timely provision of materials and services, cost reduction, and enhanced quality were identified as some of the advantages associated with effective procurement management.

Another study by Fashina et al. (2019) investigated the relationship between communication, procurement management, and project performance in the Nigerian construction industry. The study found that communication breakdown, inadequate procurement planning, and poor contract management were significant causes of delays, cost overruns, and poor quality of work in construction projects. The study also showed that effective communication and procurement management practices positively impacted project performance, leading to timely delivery, cost savings, and improved quality.

In a different investigation conducted by Alshawi et al. (2017), the focus was on evaluating how procurement management affects project performance within the construction sector. The findings indicated that project success was greatly influenced by the implementation of efficient procurement management strategies, including thorough planning, careful supplier selection, and effective contract management. Conversely, the study also highlighted that inadequate procurement management practices, such as insufficient planning and supplier selection, could result in cost overruns, delays, and subpar work quality, consequently having a negative impact on project performance.

2.4 *Review of Related Research Studies*

In a study carried out by Oyewobi et al. (2021), they aimed to evaluate the impact of communication on the performance of projects within the construction industry of Nigeria.
The study utilized a quantitative research method and collected data from construction professionals through a structured questionnaire. The findings of the study showed that effective communication has a significant positive impact on project performance, leading to improved quality, cost savings, and timely project delivery. On the other hand, poor communication among project team members can lead to conflicts, misunderstandings, and delays, which can have a negative impact on project performance. However, the research method utilized did not allow for an in-depth exploration of the topic.

In a study conducted by Gbadamosi et al. (2020), the connection between communication and performance in the construction industry of Nigeria was examined. The researchers utilized survey as their research method, which was distributed to members of project teams involved in various construction projects across Nigeria. The results of the study indicated that effective communication plays a vital role in achieving successful project delivery, resulting in improved project performance, cost savings, and client satisfaction. Conversely, communication breakdowns were found to be a significant factor contributing to delays, cost overruns, and unsatisfactory project outcomes within the Nigerian construction industry. It should be noted that the study solely focused on communication and did not take into account other potential factors influencing project performance. Nevertheless, this research makes a valuable contribution to the existing literature by emphasizing the critical role of communication in project success and emphasizing the importance of addressing communication breakdowns to prevent unfavorable project outcomes.

The critical success factor of procurement management in construction projects has been widely recognized by industry experts. As such, Ogunsemi et al. (2016) conducted a study to examine the challenges associated with procurement management in the Nigerian construction industry. Through their research, they found that insufficient planning and management, lack of transparency, and corrupt practices are major hurdles faced by procurement teams in Nigeria. The study highlights the importance of effective procurement planning, management, and implementation as essential measures that can enhance project outcomes in the Nigerian construction industry. However, the study did not provide any specific solutions for the identified challenges, leaving room for further research to investigate effective strategies for overcoming these procurement obstacles

Amusan et al. (2018) carried out an assessment of the relationship between procurement and project performance in the Nigerian construction industry. The research utilized a quantitative approach and a survey design, and data was collected from 110 construction professionals through a structured questionnaire. The findings indicated that effective procurement management is positively associated with improved project performance, including cost savings, timely delivery, and enhanced quality of work. However, the study also revealed inadequate procurement planning and management as one of the major challenges facing the Nigerian construction industry. The study is limited in that the sample size may not be representative of the entire population, and the findings may not be generalized to other regions or countries with different socio-economic and political contexts.

Olanipekun and Adegbola (2021) conducted a research study in the Nigerian construction industry to investigate the effect of procurement planning on project performance. Through their research, they found that effective procurement planning has a positive impact on project performance, resulting in cost savings, timely delivery, and improved quality of work. This study highlights the importance of procurement planning in the construction industry and the potential benefits it can have on project outcomes. However, the study also sheds light on the significant challenge of inadequate procurement planning faced by the Nigerian construction industry. This critique suggests that there is a need for increased emphasis on proper procurement planning to enhance project performance in the Nigerian construction industry. Overall, this study provides valuable insights into the role of procurement planning in construction project management and the need for improvements in the industry.

Oyegoke and Bala (2020) examined the impact of procurement methods on project performance in the Nigerian construction industry. The study found that the use of appropriate procurement methods positively influences project performance, leading to cost savings, timely delivery, and improved quality of work. The study also identified the need for effective procurement planning, management, and implementation to improve project outcomes in the Nigerian construction industry.

Unegbu et al. (2023) investigated the impacts of quality and cost management on construction projects in Nigeria using structural equation model. The Structural Equation Model (SEM) analysis, which was conducted to evaluate the influence of quality and cost management on construction project performance, revealed a significant impact. The most robust correlation was observed between project cost monitoring and control and construction phase performance. Consequently, industry stakeholders must take immediate action to tackle the factors that impede the effective implementation of quality and cost management, with the goal

From the foregoing, the Nigerian construction industry is facing significant challenges, including inadequate communication and poor procurement management practices, leading to delays, cost overruns, poor quality, and safety issues. Therefore, there is a need to examine the impact of communication and procurement management on project performance and provide evidence-based recommendations for improving project management practices in the Nigerian construction industry. The study aims to fill this research gap by examining the impact of communication and procurement management on the performance of construction projects in Nigeria.

2.5 Structural Equation Modeling (SEM)

Structural Equation Modeling (SEM) is a statistical technique utilized to examine and validate causal connections between observed and underlying variables. SEM is a robust tool extensively employed in various research domains such as psychology, sociology, marketing, and education. This text offers a comprehensive overview of SEM, encompassing its constituents and its applications as highlighted in recent scholarly journals. SEM comprises three fundamental elements: the measurement model, the structural model, and the error model. The measurement model elucidates the associations between observed and underlying variables. The structural model scrutinizes the connections among underlying variables. The error model accounts for the unexplained variability in observed variables within the model. The measurement and structural models are estimated concurrently, while the error model is estimated subsequently.

The measurement model describes the connections between latent variables and their indicators, which can be continuous or categorical. To evaluate the measurement model, several goodness-of-fit statistics are used, including the chi-square, comparative fit index (CFI), and root mean square error of approximation (RMSEA). A CFI value of 0.90 or higher and an RMSEA value of 0.05 or lower indicate a satisfactory fit for the model (Hu & Bentler, 1999, Unegbu et al., 2020). On the other hand, the structural model outlines the relationships between latent variables, which can be either direct or indirect. Direct relationships occur when one latent variable predicts another, while indirect relationships involve prediction through a third latent variable. Similar to the measurement model, the goodness-of-fit statistics are used to evaluate the structural model, and the criteria for a good fit remain the same.

Furthermore, the error model accounts for the unexplained variance in observed variables that is not captured by the measurement and structural models. The evaluation of the error model is based

on standardized residuals, which should ideally be below 2 in absolute value (Kline, 2016, Unegbu et al., 2022). SEM (Structural Equation Modeling) is a widely utilized technique in various research fields. Several recent studies have employed SEM to explore different relationships. For instance, in a study conducted by Huang et al. (2018), SEM was employed to investigate the mediating role of engagement in the relationship between students' motivation and academic achievement. The findings revealed that engagement fully mediated the relationship between motivation and academic achievement. Similarly, in another study by Guo et al. (2020), SEM was employed to examine the relationship between personality traits and mental health, with resilience serving as a partial mediator.

3. METHODOLOGY

The study adopted a quantitative research method to gather and analyse data. Quantitative research method involves the collection of numerical data and their statistical analysis to make generalizations about a phenomenon (Creswell, 2014). The data were collected using a structured questionnaire administered to two hundred and sixty professionals in the Nigerian construction industry. This include project managers, consultants, architects, civil engineers, quantity surveyors and mechanical/electrical engineers. The variables used for the design of the questionnaire were selected based on the reviewed literatures. The research study was carried out in five phases. The first phase involved an extensive review of the literature on the research study in order to identify the variables which will be categorized for data collection. In the second phase, a hypothetical SEM model will be developed using the identified variables in the literature review. The third phase involves the designing and administering of the questionnaire to collect data from the respondents. The fourth phase involves the testing, modification and validation of the hypothetical SEM model in order to determine the impact of procurement and communication management of project performance. Lastly in the fifth phase, the analyses of the factors hindering the implementation of effective procurement and communication management was analysed using confirmatory factor analyses.

3.1 Sampling Technique

The study employed a non-probability sampling technique to select participants from the population of professionals in the Nigerian construction industry. Non-probability sampling technique was chosen because it is convenient and cost-effective (Creswell, 2014). The participants were selected based on their availability and willingness to participate in the study. The sample size for the study was calculated from a population of 648 construction professionals using the sample size formula below to arrive at 260.

n = (Z^2 * p * q) / e^2

Where: n = sample size Z = z-value (confidence level) p = population proportion q = 1 - p e= margin of error (Pfeiffer and Pfeiffer, 2018).

3.2 Data Collection

The study collected data through a structured questionnaire, which was developed based on the research objectives and existing literature. The questionnaire consisted of five sections. The first section aimed to gather information about the respondents' demographics and their construction companies. In the second section, a five-point Likert scale was used to collect data on communication management, including six constructs and 19 variables. Similarly, in the third section, data on procurement management was collected using the same Likert scale, encompassing six constructs and 31 variables. The frameworks for sections 2 and 3 were informed by previous research on procurement and communication management in the construction industry (Liu et al., 2018; Mukhtar et al., 2020; Wang et al., 2019).

The fourth section of the questionnaire focused on performance measures, which included four constructs and 12 variables. The same Likert scale was used for this section. The framework for this

section (Table 3.3) identified four key areas of project performance: time, cost, quality, and scope. Each area was further divided into specific indicators for assessment. This framework drew guidance from the Project Management Institute (PMI) and the International Organization for Standardization (ISO) in measuring project performance (PMI, 2017; ISO, 2018). It was also aligned with previous studies conducted in the Nigerian construction industry (Olanrewaju et al., 2020; Ayodeji et al., 2019).

The final section of the questionnaire, using the same Likert scale, aimed to collect data on factors influencing the implementation of communication and procurement management. The literature sources for each section of the questionnaire were incorporated into the framework. The questionnaire was self-administered, and participants were given a three-week period to complete and return it.

Table 3.1 Framework for Data Collection Communication Management

SN	Constructs	Variables	Label	References
1.	Project Environment (PE)	Stakeholder identification and analysis were effective	X01	Kim and Ballard (2012); Olander and Landin (2007)
2.		Communication channels and technology were effective	X02	Love et al. (2015); Alarcon and Daim (2014)
3.		Cultural and language diversity were well managed	X03	Mak and Picken (2012); Fu and Drew (2015)
4.	Communication Plan (CP)	Communication objectives and strategies were effective	X04	Turner and Muller (2010); Chua et al. (2017)
5.		Roles and responsibilities were well assigned	X05	Pinto and Slevin (1988); Bresnen and Marshall (2000)
6.		Timelines and milestones were met	X06	Shen et al. (2017); Odeyinka and Yusif (2016)
7.	Communication Flow (CF)	Message encoding and decoding were easy	X07	Singh et al. (2017); Sutrisna and Kim (2016)
8.		Feedback and clarification were regular	X08	Hu et al. (2012); Aziz and Arif (2013)
9.		Conflict resolution and negotiation were well managed	X09	Golew and Alarcon (2016); Scott and Livesey (2016)
10.	Communication Skills (CS)	Oral and written communication were appropriate	X10	Haddad and Tezel (2014); Wood and Ellis (2005)
11.		Active listening and empathy were observed	X11	Tjosvold and Yu (2007); Tardif and Vaillancourt (2017)
12.		Emotional intelligence and cultural awareness were adopted	X12	Bartlett and Ghoshal (2002); Holm and Lindgren (2012)
13.	Communication Tools (CT)	Project management software was utilized	X13	Karim and Anumba (2017); Ameyaw and Adinyira (2019)
14.		Information and document management were effective	X14	Salama and Azzazy (2017); Ogunlana and Li (2001)
15.		Visualization and graphics were utilized	X15	Zhang and Kim (2019); El-Mashaleh and Al-Momani (2016)
16.		Social media and networking were adopted	X16	Chen et al. (2015); Du et al. (2018)
17.	Organizational Culture (OC)	Communication norms and values were observed	X17	Smith and Love (2001); Iqbal et al. (2017)
18.		Team dynamics and collaboration were adopted	X18	Ingason and Jonasson (2016); Silvius et al. (2014)
19.		Leadership and management style	X19	Pinto and Kharbanda (1995); Chiu and Tserng (2017)

Table 3.2 Framework for Data Collection on Procurement Management

SN	Construct	Variable	Label	Reference
1.	Procurement Models (PM)	Traditional procurement model was utilized	X11	Akintoye et al. (2003), Masterman (2005), Ponniah et al. (2017), Smith (2017), Chan and Kumaraswamy (2018)
2.		Design and build procurement model was utilized	X12	
3.		Construction management procurement model was utilized	X13	
4.		Public-private partnership procurement model was utilized	X14	
5.	Procurement Process (PP)	Procurement planning was carried out	X21	Bubshait et al. (2014), Göransson and Lööf (2017), Tukel and Rom (2018), Anwar and Al-Abbadi (2019), Wang et al. (2019)
6.		Pre-qualification of bidders was carried out	X22	
7.		Bid documents preparation and issuance was carried out	X23	
8.		Bid evaluation and selection was carried out	X24	
9.		Contract award and administration were carried out	X25	
10.		Contract closeout was carried out	X26	
11.	Procurement Risks (PR)	Project risks (e.g. technical, schedule, cost) were mitigated	X31	El-Gohary et al. (2016), Li et al. (2016), Liu and Fan (2017), Wang and Li (2019), Zhang et al. (2019)
12.		Supply chain risks (e.g. supplier reliability, quality, capacity) were mitigated	X32	
13.		Contractual risks (e.g. unclear contract terms, disputes, breach of contract) were mitigated	X33	
14.		Market risks (e.g. price volatility, demand fluctuations) were mitigated	X34	
15.		Political risks (e.g. policy changes, trade barriers, corruption) were mitigated	X35	
16.	Procurement Performance (PRP)	Time performance (e.g. procurement lead time, delivery schedule adherence) was effective	X41	Li et al. (2013), Abdul-Rahman et al. (2015), Chan and Kumaraswamy (2018), Al- Qaryouti et al. (2019), Dong et al. (2019)
17.		Cost performance (e.g. procurement cost, total cost of ownership) was effective	X42	
18.		Quality performance (e.g. supplier quality, compliance with specifications) was effective	X43	
19.		Risk performance (e.g. risk management effectiveness, risk mitigation) was effective	X44	
20.		Relationship performance (e.g. collaboration, communication, trust) was effective	X45	
21.	Procurement Strategy (PS)	Competitive bidding strategy was observed	X51	Osei-Kyei and Chan (2015), Hamedi and Ogunlana (2017), Göransson and Lööf (2018), Suresh and Srivastava (2018), Park and Kim (2019)
22.		Negotiation strategy was observed	X52	
23.		Partnering strategy was observed	X53	
24.		Supplier development strategy was observed	X54	

25.		Supply chain integration strategy was observed	X55	
26.	Procurement Technology (PT)	E-procurement systems were utilized	X61	Othman et al. (2014), Shen et al. (2018), Singh et al. (2018), Zhang et al. (2018), Wang and Chen (2019)
27.		Electronic reverse auctions were utilized	X62	
28.		RFID technology was utilized	X63	
29.		Blockchain technology was utilized	X64	
29.		Artificial intelligence was utilized	X65	
30.		Big data analytics was utilized	X66	

Table 3.3 The framework for collecting data on project performance in the Nigerian construction industry

SN	Construct	Indicators	Label
1	Time (TE)	The difference between the planned schedule and the actual schedule was not significant	Y01
2		The ratio of the earned value to the planned value was significant	Y02
3		The actual time taken to complete the project was on schedule	Y03
4	Cost (CT)	The difference between the planned cost and the actual cost was not significant	Y04
5		The ratio of the earned value to the actual cost was significant	Y05
6		The actual cost incurred in completing the project was within budget	Y06
7	Quality (QY)	The level of satisfaction of the project's end-users with the quality of the delivered product was high	Y07
8		The number of defects per unit of work was not significant	Y08
9		The percentage of work completed correctly the first time was high	Y09
10	Scope (SE)	The difference between the planned scope and the actual scope was not significant	Y10
11		The ratio of the earned value to the planned value was high	Y11
12		The uncontrolled expansion of the project scope was not significant	Y12

Table 3.4 Factors that Influence the Successful Implementation of Procurement Management in the Nigerian Construction Sector.

SN	Factor	Variables	Label	Citation
1.	Leadership (LP)	Management support	X01	(Oluwale et al., 2016); (Musa et al., 2017)
2.		Accountability	X02	
3.		Teamwork	X03	
4.		Positive Attitude	X04	
5.		Commitment	X05	
6.	Regulation (RN)	Procurement policies	X06	(Aje and Oluwaseun, 2018); (Ezema et al., 2021)
7.		Procurement regulations	X07	
8.		Enforcement	X08	
9.		Procurement procedures	X09	
10.		Ethics	X10	
11.		Legal framework	X11	
12.	Competence (CE)	Procurement knowledge	X12	(Babalola and Ogunsemi, 2015); (Ogunlana and Promkuntong, 2017)
13.		Continuous learning	X13	
14.		Technical skills	X14	
15.		Negotiation skills	X15	
16.		Project management skills	X16	

17.	Communication (CN)	Stakeholder engagement	X17	(Oluwale et al., 2016); (Ogunde et al., 2017)
18.		Feedback mechanisms	X18	
19.		Active listening	X19	
20.		Persuasion	X20	
21.		Timely information sharing	X21	
22.		Conflict resolution	X22	
23.	Technology (TY)	Electronic procurement systems	X23	(Oyedele et al., 2019); (Ojo and Adeaga, 2019)
24.		Technology infrastructure	X24	
25.		Technology adoption	X25	
26.		Compatibility	X26	
27.		Technology support	X27	
28.		Security	X28	

3.3 Data Analysis

The collected data underwent various analytical techniques to ensure comprehensive evaluation. Descriptive statistics, composite reliability (CR), average variance extracted (AVE), Cronbach's alpha test, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modeling (SEM) were employed for this purpose. The software tools utilized included Microsoft Excel, Statistical Package for the Social Sciences (SPSS), and Linear Structural Relations (LISREL). SPSS was specifically used in conjunction with descriptive statistics to examine the demographic characteristics of the respondents and their respective construction companies. Microsoft Excel was employed to calculate the reliability and validity of the constructs through composite reliability and average variance extracted, respectively. Furthermore, the internal consistency of the questionnaire was assessed using Cronbach's alpha test in SPSS. To determine the significance of values for further analyses, a threshold of 0.6 was established, as suggested by Karl et al. (2016).

Composite reliability refers to the evaluation of how consistent a collection of items or variables are internally. This evaluation involves dividing the variance of the actual scores by the overall variance of the observed scores. The calculation for CR involves the following formula:

CR = (sum of the factor loadings)^2 / [(sum of the factor loadings)^2 + sum of the unique variances].

A greater CR value indicates enhanced internal consistency and data reliability. Conversely, AVE measures convergent validity, obtained by dividing the sum of squared factor loadings by the sum of squared factor loadings and unique variances. A higher AVE value suggests stronger convergent validity, indicating that the measure items assess the same underlying construct (Hair et al., 2010, Unegbu et al., 2022).

In order to reduce the number of variables used in the CFA and SEM, an EFA was conducted in SPSS. An accepted significant level of 0.6 was employed as the benchmark. The SEM was utilized to analyse the influence of procurement and communication management on construction project performance. The hypothetical model was tested using SIMPLES Syntax and subsequently modified and validated using five goodness-of-fit statistics (Table 3.5).

Table 3.5 The Good of Fit Statistics

SN	Goodness of Fit Statistic	Definition	Recommended Value	Interpretation
1	Chi-square test	Rewrite the script to eliminate similarity between the observed	P-value > 0.05	If the value of P is above 0.05, it signifies that the model adequately represents the data.

		covariance matrix and the estimated covariance matrix.		Conversely, if the P-value is below 0.05, it suggests that the model does not sufficiently capture the data.
2	Root Mean Square Error of Approximation (RMSEA)	The dissimilarity is determined by comparing the forecasted covariance matrix to the actual covariance matrix while taking into account the level of complexity in the model.	0.05 or less	A value below 0.05 signifies a favorable match, while values ranging from 0.05 to 0.08 are considered satisfactory. If the value exceeds 0.10, it suggests an unsatisfactory match.
3	Comparative Fit Index (CFI)	The ratio of the improvement in fit between the hypothesized model and a null model to the improvement in fit expected by chance.	0.90 or greater	A value of 0.90 or greater indicates a good fit. Values between 0.80 and 0.90 are acceptable. Values less than 0.80 indicate a poor fit.
4	Tucker-Lewis Index (TLI)	A variation of the CFI that takes into account the complexity of the model.	0.90 or greater	If the value is 0.90 or higher, it suggests a strong match. Acceptable matches fall within the range of 0.80 to 0.90. Values below 0.80 indicate a weak match.
5	Standardized Root Mean Square Residual (SRMR)	The mean disparity between the observed covariance matrix and the anticipated covariance matrix.	0.08 or less	A good fit is indicated by a value of 0.08 or lower. Acceptable values range from 0.08 to 0.10. Values exceeding 0.10 indicate a poor fit.

It's important to note that no single goodness of fit statistic can provide a definitive assessment of model fit. Rather, it's recommended to use a combination of multiple statistics to evaluate the fit of the model (Kline, 2015; Hu and Bentler, 1999; Byrne, 2012, Unegbu et al., 2022).

3.4 *Hypothetical Model*

Structural Equation Modeling (SEM) is a statistical method that involves the estimation of relationships among latent and observed variables. The development of a hypothetical SEM model requires a solid theoretical and empirical foundation. The theoretical basis can come from existing theories or can be developed based on empirical findings. The empirical basis can come from existing literature or from data collected for the specific study. By using a strong theoretical and empirical foundation, researchers can develop a robust SEM model that can provide insights into complex relationships between variables (Ryan & Deci, 2000; Simons-Morton et al., 2010; Ryan & Deci, 2000; Vansteenkiste et al., 2004).

The frameworks for communication management, procurement management and project performance were used to develop the hypothetical model based on the reviewed literatures and support

from ten selected experts in the construction industry. Altogether six constructs of communication management (project environment, communication plan, communication flow, communication tools and organizational culture), six constructs of procurement management (procurement models, procurement processes. Procurement performance, and procurement strategy) and the four constructs of construction project performance (time, cost, quality and scope) were used for this purpose resulting in thirty five hypotheses. It is important to note that some potential hypotheses were not considered to avoid crossing of so many lines in the model.

On the bases of the hypothetical model, a SIMPLES Syntax for the SEM in LISREL using SIMPLES Project was developed as shown.

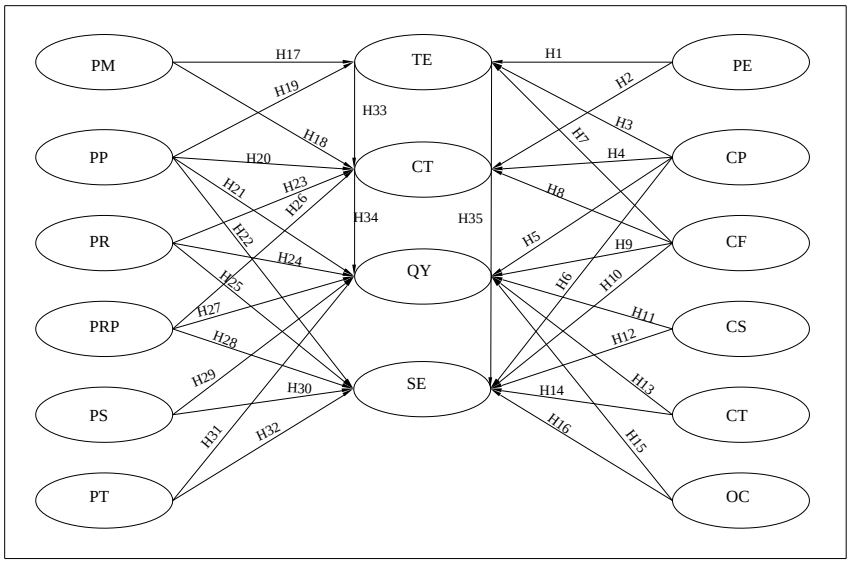

Figure 3.1 Hypothetical SEM Model

1. Project environment positively impacts project time or schedule performance.
2. Project environment positively impacts project cost performance
3. Communication plan positively impacts project time or schedule performance.
4. Communication plan positively impacts project cost performance.
5. Communication plan positively impacts project quality performance.
6. Communication plan positively impacts project scope performance.
7. Communication flow positively impacts project time or schedule performance
8. Communication flow positively impacts project cost performance.
9. Communication flow positively impacts project quality performance.
10. Communication flow positively impacts project scope performance.
11. Communication skills positively impact project quality performance.
12. Communication skills positively impact project scope performance
13. Communication tools positively impact project quality performance.
14. Communication tools positively impact project scope performance
15. Organizational culture positively impacts project quality performance.
16. Organizational culture positively impacts project scope performance.
17. Procurement models positively impact project time or schedule performance.
18. Procurement models positively impact project quality performance
19. Procurement processes positively impact project time or schedule performance.
20. Procurement processes positively impact project cost performance
21. Procurement processes positively impact project quality performance.
22. Procurement processes positively impact project scope performance.
23. Procurement risk positively impacts project cost performance.
24. Procurement risk positively impacts project quality performance.
25. Procurement risk positively impacts project scope performance.
26. Procurement performance positively impacts project cost performance.

27. Procurement performance positively impacts project quality performance
28. Procurement performance positively impacts project scope performance.
29. Procurement strategy directly impacts project quality performance
30. Procurement strategy directly impacts project scope performance
31. Procurement technology directly impacts project quality performance
32. Procurement technology directly impacts project scope performance
33. Time performance directly impacts project cost performance
34. Time performance directly impacts project quality performance
35. Time performance directly impacts project scope performance

SIMPLES Syntax for SEM

Raw Data from file 'C:\Users\user\Desktop\SPSS\sem 1.psf'
Latent Variables PE CP PS CF CS CT OC PM PP PR PRP PT TE CT QY SE
Relationships
TE =PE CP CF PM PP CT QY SE
CT =PE CF CP PM PP PR PRP
QY =CP CF CS CT OC PP PR PRP PS PT
SE =CP CF CS CT OC PP PR PRP PS PT
Y01-Y03 =TE
Y04-Y06 =CT
Y07-Y09 =QY
Y10-Y12 =SE
X01-X03 =PE
X04-X06 =CP
X07-X09 =CF
X10-X12 =CS
X13-X16 =CT
X17-X19 =OC
X11.-X14. =PM
X21-X24 =PP
X31-X34 =PR
X41-X44 =PRP
X51-X54 =PS
X61-X64 =PT
Path Diagram
End of Problem

4: RESULTS AND DISCUSSION

4.1 Responses

A total of 260 questionnaires were distributed to potential participants, with 235 completed questionnaires returned, resulting in a response rate of 90%. The demographic analyses of the respondents using descriptive statistics showed that 45% were Civil and Structural engineers, 14% were Architects, 12% were Quantitate Surveyors and 19% were Mechanical and Electrical Engineers. This also implies that all the respondents have at least a degree in their profession. This result is in tandem with the recommendation that a higher proportion of respondents should be from the Civil and Structural Engineering profession because of their involvement in the bulk of the construction project work (Hwang and Lim, 2013). The result also shows that 84% of the respondents have at least ten years of work experience in the construction industry. The study of Chua et al. (1999) revealed that capability of a professional in the construction industry to effectively respond to a structured questionnaire in the construction industry is highly determined by their level of work experience.

4.2 Preliminary Data Analyses

The result of the preliminary data analyse is shown in Table 4.1 which indicated that fifteen of the constructs had a CR and AVE value greater than 0.5 as recommended in the literature. Communication tools failed this test and was therefore removed from subsequent analyses. This result validates the reliability and validity of the data collected using the constructs. Also the result of the internal consistence of the questionnaire used for data collection using the Cronbach's alpha test was significant for all the constructs with values greater than 0.5 which indicates high level of consistence (Karl et al., 2016). Out of the 62 variables used for the EFA, 8 were dropped with factor loadings less than 0.5 as shown on Table 4.2. With this result, all the constructs used for the SEM had at least 3 observed variables.

Table 4.1 The Reliability and Validity Test Result

SN	Construct	AVE	(a)	CR
1	Time (TE)	0.651	0.835	0.696
2	Cost (CT)	0. 872	0.784	0.860
3	Quality (QY)	0.730	0.7956	0.854
4	Scope (SE)	0.656	0.778	0.869
5	Project Environment (PE)	0.620	0.672	0.785
6	Communication Plan (CP)	0.621	0.764	0.789
7	Communication Flow (CF)	0.588	0.876	0.798
8	Communication Skills (CS)	0.687	0.778	0.679
9	Communication Tools (CT)	0.351	0.763	0.865
10	Organizational Culture (OC)	0.784	0.889	0.867
11	Procurement Models (PM)	0.598	0.8674	0.865
12	Procurement Process (PP)	0.665	0.842	0.856
13	Procurement Risks (PR)	0.847	0.876	0.579
14	Procurement Performance (PRP)	0.867	0.823	0.587
15	Procurement Strategy (PS)	0.867	0.818	0.598
16	Procurement Technology (PT)	0.884	0.875	0.587

Table 4.2 Exploratory Factor Analyses Result

SN	Variables	Factor Loading
1	Y01	.716
2	Y02	.620
3	Y03	.803
4	Y04	.708
5	Y05	.603
6	Y06	.851
7	Y07	.784
8	Y08	.758
9	Y09	.621
10	Y10	.516

11	Y11	.520
12	Y12	.703
13	X01	.608
14	X02	.833
15	X03	.671
16	X04	. 843
17	X05	.768
18	X06	.691
19	X07	.766
20	X08	.670
21	X09	.746
22	X10	.520
23	X11	.593
24	X12	.678
25	X13	.603
26	X14	.351
27	X15	.584
28	X16	.728
29	X17	.686
30	X18	.765
31	X19	.567
32	X11.	.712
33	X12.	.549
34	X13.	.643
35	X14.	.832
36	X21	.584
37	X22	.609
38	X23	.628
39	X24	.574
40	X25	.420
41	X26	.403
42	X31	.758
43	X32	.693
44	X33	.751
45	X34	.884
46	X35	.328
47	X41	.621
48	X42	.866
49	X43	.568
50	X44	.780
51	X45	.408
52	X51	.673
53	X52	.791
54	X53	.884
55	X54	.728
56	X55	.421

57	X61	.603
58	X62	.851
59	X63	.589
60	X64	.828
61	X65	.428
62	X66	.428

4.3 The Impact of Procurement and Communication Management on Project Performance

Figure 4.1 shows the result of the hypothetical SEM model test with the resulting experimental model that required modification to obtain an improved goodness of fit statistics. The model was modified by deleting the path coefficients with very small values which include the following paths PT-SE, PS-SE, CT-QY and OC-SE. This resulted to an improvement in the final SEM model (modified SEM model) Figure 4.2, which was accepted based on the goodness of fit statistics with a Root Mean Square Error of Approximation (RMSEA) value of 0.69, Standardized Root Mean Square Residual (SRMR) of 0.56, Comparative Fit Index (CFI) of 0.774, Tucker-Lewis Index (TLI) of 0.732 and Chi-square test value of 1.54 which are all respectively significant (Karl et al., 2016.

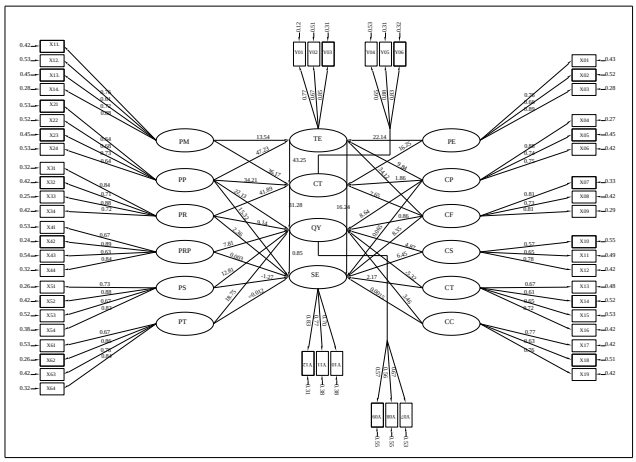

Figure 4.1 The Experimental SEM Model

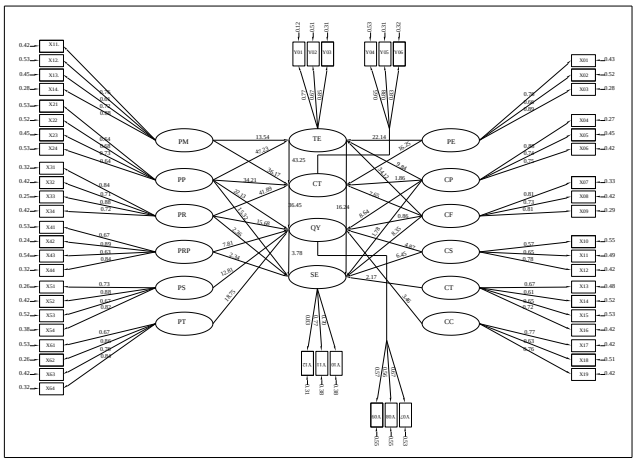

Figure 4.2 The Modified SEM Model

The outcome of the goodness of fit statics and the value of the path coefficients of the relationship resulted in the validation and rejection of the following hypotheses as shown in Table 4.3.

Table 4.3 The Validated and Rejected Relationships

Hypotheses	Validated	Rejected
H1	Yes	
H2	Yes	
H3	Yes	
H4	Yes	
H5	Yes	
H6	Yes	
H7	Yes	
H8	Yes	
H9	Yes	
H10	Yes	
H11	Yes	
H12	Yes	
H13		Yes
H14	Yes	
H15	Yes	
H16		Yes
H17	Yes	
H18	Yes	
H19	Yes	
H20	Yes	
H21	Yes	
H22	Yes	
H23	Yes	
H24	Yes	
H25	Yes	
H26	Yes	
H27	Yes	
H28	Yes	
H29	Yes	
H30		Yes
H31	Yes	
H32		Yes
H33	Yes	
H34	Yes	
H35	Yes	

4.4 Understanding the Influences on the Execution of Procurement and Communication Management Techniques.

Figure 4.3 illustrates the outcomes of the analyses conducted on the factors influencing the execution of procurement and communication management in construction projects in Nigeria. The findings reveal that all the identified variables exert a noteworthy impact on the successful implementation of procurement and communication management in the Nigerian construction sector, as evidenced by factor loadings surpassing 0.5.

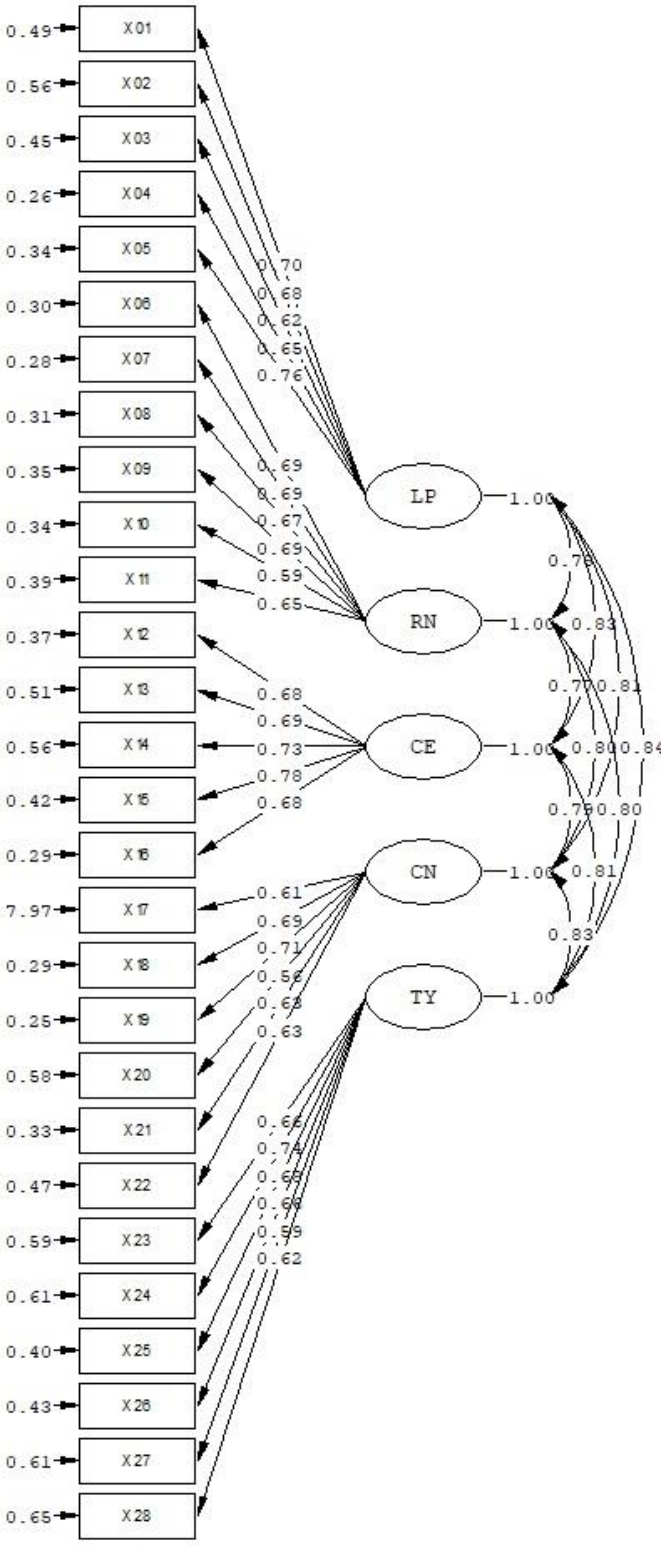

Figure 4.3 CFA for the Factors Affecting the Implementation of Procurement and Communication Management

4.5 Discussion

The impact of procurement and communication management on the performance of construction projects in Nigeria was investigated using thirty five hypotheses. From the result of the modified SEM model, only four (H13, H16, H30, and H32) were rejected while the rest were validated. Three of the rejected hypotheses were the impact of procurement technology (PT), procurement strategy (PS) and

organizational culture (OC) on scope performance. This implies that the level of application of procurement management and strategy, and organizational culture have no significant impact on project scope performance. This further indicated the poor utilization of these constructs in the management of construction projects. The fourth rejected hypothesis is the impact of communications tools (CT) on quality performance which may imply poor utilization of communications tools by the construction companies in the management of their projects.

The evaluation of 31 out of all the hypotheses confirms the substantial influence of procurement and communication management on project performance in terms of time, cost, quality, and scope. The findings indicate that proficient procurement management (PM, PP, PR, PRP, PS, and PT) significantly contributes to project performance, aligning with previous research that emphasizes the crucial role of procurement in achieving project success (Ibbs et al., 2001; Enshassi et al., 2009). Furthermore, the results demonstrate that effective communication management (PE, CP, CF, CT, CS, and OC constructs) also has a significant positive impact on project performance.

Specifically, it established a strong positive correlation between communication management and time performance, cost performance, quality performance, and scope performance. These findings are consistent with previous studies that have found communication to be a critical factor in project success (Bryde, 2008; Okereke et al., 2014). The result also showed that both communication and procurement management significantly contribute to project performance, with procurement management having a stronger impact on time and cost performances as indicated by the paths PR-CT, PP-CT and PP-CT, with path coefficients of 47.21, 41.89 and 34.21 respectively, while communication management had a stronger impact on time performance as shown by the path CF-TE with a path coefficient of 34.12. In addition, time performance was found to be critical to the performance of both quality and cost as indicated by the paths TE-CT and TE-QY with high path coefficients of 43.32 and 36.45 respectively. Thus implying that effective time performance has the capacity to improve cost and quality performances.

The outcome of the CFA conducted on the factors influencing the implementation of procurement and communication management in the Nigerian construction sector revealed that all the identified factors have a noteworthy impact on their successful implementation. This indicates that the efforts made by the government, regulatory bodies, and industry stakeholders to address these factors have not yielded the desired outcomes. Consequently, stakeholders should develop more deliberate and effective strategies to mitigate these factors and enhance the performance of construction projects.

The results of this research have significant implications for project managers and construction professionals operating in the Nigerian construction industry. The study emphasizes the crucial role of efficient communication and procurement management in achieving project success. Project managers should prioritize the implementation of effective communication and procurement management techniques to enhance project performance. Furthermore, these findings serve as a foundation for future research to delve into the specific practices of communication and procurement management that prove most effective in the Nigerian construction industry.

5. CONCLUSION

This study aimed to examine the influence of procurement and communication management practices on the performance of construction projects in Nigeria. Additionally, it sought to identify and analyze the factors that impact the effective implementation of these practices in the construction industry. A total of 260 survey questionnaires were distributed to industry professionals in the North Central Geopolitical Zone of Nigeria. Out of the 235 valid responses received, data analyses were conducted to test the structural equation model (SEM) and perform confirmatory factor analysis (CFA) after preliminary data analyses to ensure data reliability and validity.

The SEM analyses yielded results validating 31 out of the 35 hypotheses used in the study. The strongest relationships were found between procurement management and time performance, procurement management and cost performance, time performance and cost performance, time performance and quality performance, and communication management and time performance, in that order. Hence, effective communication and procurement management were identified as crucial factors for achieving project success in the Nigerian construction industry. The study also revealed a strong

positive correlation between communication management and time, cost, quality, and scope performance, as well as a similar positive correlation between procurement management and overall project performance. Moreover, the analysis of factors influencing the effective implementation of procurement and communication management in the Nigerian construction industry indicated the need for stakeholders to proactively develop strategies that foster the effective implementation of these practices, ultimately improving the performance of their construction projects.

Based on the study's findings, it is recommended that project managers prioritize effective communication management in their projects by utilizing clear communication channels, holding regular meetings, and providing timely feedback to enhance project performance. Additionally, adopting effective procurement management practices, such as early contractor involvement and comprehensive risk assessment, is advised to improve project outcomes. Construction professionals are also encouraged to invest in training and development to enhance their skills and knowledge in communication and procurement management.

It is important to acknowledge certain limitations of this study. Firstly, the sample population was limited to the Nigerian construction industry, so the findings may not be applicable to other countries or regions. Secondly, the study solely employed quantitative methods for data collection and analysis, suggesting that future research could incorporate qualitative approaches to gain a more comprehensive understanding of communication and procurement management practices in the Nigerian construction industry. Further investigations could also explore the specific communication and procurement management practices that prove most effective in the Nigerian context. Additionally, future research endeavours may investigate the impact of other project management factors, such as risk management and stakeholder management, on project performance within the Nigerian construction industry.

ACKNOWLEDGEMENT

I want to express my gratitude to Professor D.S. Yawas and Dr. B. Dan-asabe for helping me to come up with this article. You have been my great source of inspiration and courage. Also my gratitude goes to Engr. Jubril S. who assisted me greatly in collecting data from the sampled construction companies.

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