

## Project Management Strategies and Operational Efficiency of Construction Firms in South-South, Nigeria

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### Abstract

The construction firms are plague with projects, cost overrun, fall in quality, and operational inefficiency. As a result, this study examined the relationship between project management strategies and operational efficiency of construction firms in South-South, Nigeria. The study was built on systems theory, resource-based view theory and project management theory. The study adopted the cross-sectional research design and followed the positivism approach. The population of the study stemmed from 792 employees selected from eight construction companies. Using the Taro Yemane formula, the sample size was determined as 266. The simple random sampling technique was used. Structured questionnaires were used to collect the primary data. Descriptive statistics and Spearman rank correlation coefficient were used as methods of data analysis, which was carried out with the help of SPSS version 28 at 0.05 level of significance. The results showed that operational efficiency was positively and significantly related with project planning ( $r = 0.346$ ,  $p < 0.05$ ), project cost management ( $r = 0.563$ ,  $p < 0.05$ ), project risk management ( $r = 0.436$ ,  $p < 0.05$ ), project time management ( $r = 0.355$ ,  $p < 0.05$ ), and project quality management ( $r = 0.720$ ,  $p < 0.05$ ). The study concluded that the effective project management strategies were very effective in the operational efficiency of construction firms in South-South, Nigeria. The study recommended for resilient planning, cost control, risk management and scheduling and institutionalization of quality assurance systems. The study contributed to knowledge as it has generated empirical evidence of the relationship between project management strategies and operational efficiency of construction firms in South-South Nigeria.

**Keywords:** Project Planning; Project Cost; Risk; Management; Quality; Operational Efficiency

### 1. Introduction

The construction industry is important for supporting the economic development as it creates infrastructure, employment, stimulates investment and support the industrial development. In developing economies such as Nigeria construction sector is important in the provision of residential, commercial and industrial facilities to the economy, which contribute to the production of gross domestic product. However, the ability of construction companies to perform efficiently largely relies on the way they perform when it comes to delivering projects on time, meeting budget expectations, provision of quality structures, and avoidance of wastages during operations. In modern days where construction projects are becoming more complex, project management strategies are becoming more crucial as they help in boosting operational efficiency of an organization (Project Management Institute [PMI], 2021; Kerzner, 2022). This can be achieved when construction firms maximize the utilization of available resources; synchronize the various activities, manage uncertainty, and improve deliverables of project through proper integration of project management strategies in a highly competitive environment (Adeleke et al., 2018; Ugwu et al., 2020).

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Project planning is a crucial project management task that is applied in the development of a project plan – the project's goals, scope, schedule, resources, and implementation plan. Good Planning helps to integrate project activities systematically and connects with organization's objectives. Planning leads to better coordination between stakeholders, allocation of resources and operational effectiveness (Kerzner, 2022; PMI, 2021). Studies have revealed that companies with good planning are able to meet project goals and have a stable operation (Adeleke et al., 2018; Ugwu et al., 2020).

Project cost management is another important aspect in project management. It includes planning, estimating, tracking and regulating project costs to make sure that projects stay within the permitted budget. One of the challenges that are always faced by construction companies in Nigeria is cost overrun; it can lead to reduced profitability and operational inefficiencies of the construction company. Cost management ensures companies know where their cash is going, ensures that none is lost, and helps them to make the best use of resources. Project risk management entails identifying, assessing and managing the potential risks associated with a project. The systematic risk assessment and response planning can help organisations overcome uncertainties and improve their decision making as well as operational resilience (PMI, 2021; Kerzner, 2022). Empirical evidences have shown that companies with proper cost and risk management systems are better in their operations compared to companies with weak cost and risk management systems (Adeleke et al., 2018 and Ugwu et al., 2020).

Project time and quality management are critical to the success of a project. Time Management is the creation of a schedule, the tracking of progress and the completion of the project activities within a specified period. Good time management helps companies enhance work coordination and drive the best productivity of the resources (PMI, 2021; Kerzner, 2022). Project quality management; however, is used to ensure that the project outputs meet the required value and stakeholders' expectations by applying quality planning, assurance and control processes. Good project delivery results in customer satisfaction, reduces rework and enhances the organization reputation. According to Porter (1985) operational efficiency is the capacity of an organisation to carry out activities at a lower cost than another organisation, minimise waste and maximise value creation. Operation efficiency with regard to construction firms is defined by the usage of resources, productivity, time performance and cost-effectiveness (Irefin, 2013; Ugwu et al., 2020). This study therefore has become imperative in view of the seemingly unending occurrences of project delays, cost overruns and substandard quality of projects by construction companies in the South-South Nigeria.

### **1.1. Statement of the Problem**

Previous studies have clearly demonstrated the impact of project management practices on the performance of an organization in the construction industry. For instance, Adeleke et al. (2018) studied project management competencies and project performance and Ugwu et al., (2020) explored project delivery issues in the Nigerian construction industry. Likewise, the PMI (2021) and Kerzner (2022) highlighted the significance of strategic management with regards to planning, cost management, risk management, scheduling and quality assurance in project implementation. A closer look at the studies showed that they all measured project success and project completion as outcome variable. Thus, this study fills the gap in literature by utilizing operational efficiency as the criterion variable. It is used in this study because it enables us to understand if effective project management strategies ensure the operational efficiency of construction firms. Operational efficiency ensures doing similar things more efficiently than your rivals with better use of resources, processes and technologies (Porter, 1985).

Also, many of the studies (Irefin, 2013; Ugwu et al., 2020; Adeleke et al., 2018) focused on separate aspects of project management and not on the cumulative effect of these strategies. Hence, there are paucity of studies examining the relationship between project management strategies and operational efficiency among construction firms in South-South, Nigeria. This study therefore aimed at bridging the gaps by looking at the relationship between project management strategies and operational efficiency of construction firms in the South-South, Nigeria.

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## **2. Literature Review**

### **2.1. Conceptual Framework**

#### *2.1.1. Project management strategies*

Project management strategies are the organized practices, processes and control mechanisms that are used to plan, execute, monitor and complete a project within a pre-defined objective. They are applied to provide the organizations with systematic approaches to co-ordinate resources, deal with uncertainties, manage costs, ensure quality standard and achieve project objectives. Project Management Institute (PMI) (2021) defines project management as the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements to deliver

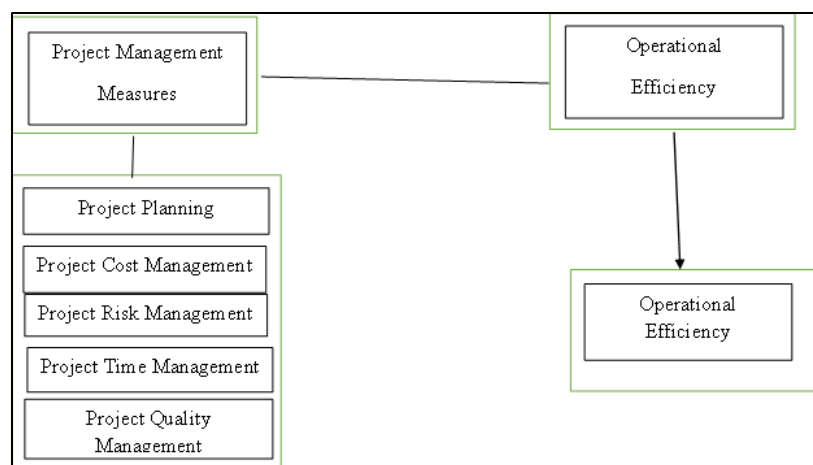
value to the stakeholders. Also, according to Kerzner (2022), project management is an integrated system that combines planning, scheduling, controlling and co-ordinating to utilize organizational resources to meet project objectives within certain limits. The use of good project management practices can help companies to increase their productivity, minimize failures and boost their performance.

The most significant aspects of a project management measure are project planning, project cost management, project risk management, project time management and project quality management. Project planning is the process of establishing project goals, determining the project activities, assigning resources and drawing up schedules for implementing project activities to help with project execution. Cost Management involves budgeting, cost estimation, tracking costs and controlling financial resources to complete the project on budget. Risk Management involves identifying, evaluating, and managing risks that could impact project results. Time management involves organizing and controlling project activities to ensure they are finished within the specified time while quality management is about project products and services meeting the needs, wants and expectations of those involved in the project (PMI, 2021; Kerzner, 2022). All of these measures put together, provide the framework of efficient project delivery and organizational effectiveness.

### 2.1.2. Operational Efficiency

Operational efficiency is a measure of how well an organisation can produce goods and services from a set of resources, manage costs and time, and attain its nominated objectives. It shows the effectiveness of an organisation in converting its inputs into valuable outputs without wasting resources and enhancing productivity. Operational efficiency is about doing similar things more efficiently than your rivals with better use of resources, processes and technologies (Porter, 1985). An efficient organisation is able to offer their product or service at a lower cost, higher quality and faster than their rivals, which boosts the performance and competitiveness of the organisation (Porter, 1985; Slack & Brandon-Jones, 2022). In construction companies, operational efficiency involves spending within budget, time, labour, equipment, and materials in a way that results in a high-quality performance. Operations efficiency helps to prevent project delays, cost overruns, customer dissatisfaction, and reduction in profitability. Irefer (2013) states that the operational efficiency can be achieved if the resources and process of an organization are well coordinated and they are able to achieve the desired results with minimum waste and maximum value added.

In today's competitive business environment, with rapidly changing technologies and customers' expectations, operational efficiency is a must. Operational efficiency is crucial for construction companies, as it directly contributes to their sustainability and profitability. Companies that can control resources and activities in a project and optimize their processes are likely to be able to deliver better results than less efficient companies. Thus, its effectiveness of operations is a significant factor that determines the success of the organization and an important outcome of good project management practices (Ugwu et al., 2020, Slack & Brandon-Jones, 2022). So, the practices of project management that organizations adopt are important to its operational efficiency.



**Source: Project management strategies:** Project planning, Project cost management, Project risk management, Project time management, and Project quality management (Kerzner, 2022; Project Management Institute, 2021; Adeleke et al., 2018; Kerzner, 2022; Ugwu et al., 2020).  
**Operational efficiency:** (Porter, 1985; Ugwu et al., 2020; Irefer, 2013).

**Figure 1** Conceptual framework on the relationship between project management strategies and operational Efficiency of construction firms in South-South, Nigeria

## 2.2. Theoretical Framework

### 2.2.1. Systems Theory

Bertalanffy (1968) developed system theory for the first time and it was used in the management and project management literature. It is based on the premise that organizations are composed of interrelated subsystems that are interdependent in achieving common goals. It was observed that an organization's effectiveness depends on how the various components are connected, coordinated and integrated within the organization rather than the effectiveness of each component. (Bertalanffy, 1968; Kerzner, 2022). The theory is based on the relationships between interconnected activities, resources and processes of an organization determine its results. Thus, for effective management it is necessary to have an integrated view of various elements of the organization.

Systems theory in project management is used to describe the relationship between planning and the other project management techniques such as cost management, risk management, time management, quality management and how they impact on a project. Projects are composed of all kinds of resources, activities and stakeholders which must be coordinated well to ensure a successful delivery of the project. The idea being that, a weakness in one area of project management may have a negative impact on the project system. For instance, poor planning may lead to poor budgeting, time running over and poor quality of the product. Thus, project management strategies must be considered as various mechanisms that, with each other, lead to a higher operational efficiency (Kerzner, 2022; PMI, 2021).

### 2.2.2. Resource-Based View (RBV)

Wernerfelt (1984) and subsequently Barney (1991) have come up with a resource-based view (RBV). RBV stipulates that a firm must have valuable, rare, inimitable and/or non-substitutable resources and to leverage them in a way that the firm can be successful in an organization. Firms with better performance have unique resources and capabilities that cannot easily be imitated by other firms (Barney 1991). This can include resources such as human resources, managerial skills, technologies, processes and knowledge resources.

The key underlying principle of the RBV is that organizations have different resources and capabilities. The companies, which will be able to develop and apply strategic resources, will be the ones who will have their competitiveness advantage and will perform better, sustainably. In the world of project management, managerial skill, planning, knowledge of risk management and quality management systems are great assets within the organization. Firms may use these capabilities to efficiently implement projects, and to achieve improved operational outcomes (Barney, 1991; Wernerfelt, 1984).

### 2.2.3. Project Management Theory

The development of the project management as a specific type of management lead to the development of project management theory. The theory emphasizes the significance of the incorporation of the following project activities: planning, scheduling, monitoring, controlling and coordinating a project's activities for the successful completion of a project. It believes that the systematic application of project management principles, methodologies and best practices during the life of the project are the keys to success in the project (Kerzner, 2022; PMI, 2021).

Project management theory emphasizes that a project is a temporary endeavor that is undertaken to create a unique product or service or result. Projects are unique in that they all have a finite start and end date, have limited resources, are complex and have an element of uncertainty and have to be managed in a structured way to achieve the outcomes desired. The theory emphasis that planning, cost control, risk management, scheduling and quality assurance are vital functions which affect the success of a project. It also indicates that with proper management, these will lead to better performance of the project, greater satisfaction of the stakeholders and better effectiveness of the organization (PMI, 2021; Kerzner, 2022).

PM theory is directly related to this study as the independent variables project planning, project cost management, project risk management, project time management and project quality management are important areas of project management. The theory provides a comprehensive set of knowledge on the operation of these measures on the effectiveness of construction companies. The project management strategies help the organization utilize resources optimally, control cost, reduce delays and tackle uncertainties and quality outcomes.

## 2.3. Empirical Review

Gitonga (2025) examined the relationship between project cost management and performance of urban roads in Kenya. The study made use of the descriptive research design. The target population was 408 construction registered

professionals in the Kenya urban roads authority projects. The size of the sample was 202. The main data was gathered by means of structured questionnaires. The results showed that the cost management of a project had a positive and significant impact on the performance of urban roads projects in Kenya. The study found that project cost management is an important factor which influences improved performance of urban roads project in Kenya.

Chen (2025) shared some latest cases of the utilization of AI-powered ABC systems and the advantages which might be provided by this technology, including a better cost accuracy, streamlines and supports operations, and assists with strategic decisions. These findings highlighted that while AI can be a powerful tool, it can also bring tangible results and a new way of thinking about cost management, helping to ensure the company's innovation, scalability and sustainable growth.

Parween et al. (2024) explored the effect of the corporate communication techniques on the performance of nanotechnology sector. The research adopted mixed methods (quantitative survey and qualitative interview with key players of nanotechnology companies). In order to measure the effectiveness of the communication techniques, the following indicators were used: innovation rate, effectiveness, project efficiency, and market competitiveness. The results of the study showed that good internal communication, fast decision making and working together collaboratively have a great impact on improving the company's performance through its good communication practices.

Syalevi et al. (2024) examined the contribution of PMOs to organizational performance using the Competing Values Framework. The researchers evaluated five models and 17 performance metrics for the IT sector and across other sectors. While a PMO's performance is the same in non-IT business areas and IT business areas, the difference lies in the focus: non-IT business areas are more likely to be focused on interpersonal relationships, competency-based training and workplace environment. Whereas, IT business areas are more likely to be focused on knowledge of PMO resource teams, efficient training, technology and collaboration to achieve success on projects.

Kanan et al. (2023) examined the relationship between TQM and corporate green performance in Pakistan. Data were obtained from managers of medium and large size manufacturing companies. Results of the structural analyses showed that there was a significant and positive effect of TQM on the corporate green performance. Also, the results revealed that corporate social responsibilities is a partial-mediator between total quality management and corporate green performance.

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### 3. Methodology

A cross-sectional survey research design was used in the study due to the availability of data from various respondents across the selected construction firms over a given period of time. Cross section design was deemed suitable for this study as it allows quantitative data to be collected across various firms over a snapshot. It also allows for the assessment of the relationships between the variables without manipulation of the study environment. The design has been extensively used in management and organizational research when researchers are interested in examining relationships between variables in the context of where they occur (Creswell & Creswell, 2018; Saunders et al., 2019). The research was based on the positivism approach. The positivist paradigm was based on an objective, measurable and researcher-independent reality. So, the items in this study were factually oriented on the facts that were observed and quantitative data collected through the use of the structured questionnaires.

The population of the study was the total number of employees in the 8 selected construction companies in South-South, Nigeria which were 792. The selection of these firms is due to their involvement in the region's big construction projects as well as having an established project management structure (Federation of Construction Industry, 2024). Taro Yamane (1967) formula was used in determining the sample size. Based on the formula, with a population of 792 and 5% level of precision, calculated sample size is 266. The sampling procedure adopted was proportionate stratified sampling where the sample was allocated to the participating firms and simple random sampling technique was used to select the individual respondents from the participating firms (Saunders et al., 2019; Taherdoost, 2017).

The study was conducted by using the primary data which were collected by structured questionnaire. The questionnaire comprised of closed items that utilized a 5-point Likert scale from "strongly disagree" (1) to "strongly agree" (5). From the literature, five dimensions of the independent variable (project management strategies) were proposed; project planning, project cost management, project risk management, project time management and project quality management (Project Management Institute, 2021; Kerzner, 2022; Adeleke et al., 2018; Ugwu et al., 2020). The indicators used to measure the dependent variable operational efficiency were suggested by Porter (1985), Irefin (2013) and Ugwu et al. (2020).

Face and content validity were used to determine the validity of the instrument. The questionnaire was sent to experts in project management and research methodology for opinion on the clarity of the measurement items and their relevance and sufficiency. They were requested to make their observation and suggestion which was used prior to the final administration of the instrument. Cronbach's Alpha coefficient was used to test for reliability and the minimum value of 0.70 was set for internal consistency. This method was in line with the recommendations available on the research instruments in social science (Hair et al., 2019; Taber, 2018).

Descriptive and inferential statistical techniques were used to analyse the data. Descriptive data were used to present the respondents' demographic characteristics as well as their responses in the form of mean, standard deviation, frequency and percentage. Since the data gathered from the study were measured using Likert type measurements, which is an Ordinal scale, the hypotheses were tested using Spearman rank correlation coefficient. This was used to determine the strength and direction of the relationships among the variables (Field, 2018; Pallant, 2020) at the 0.05 level of significance.

#### 4. Results

**Table 2** Questionnaire Distribution and Number Retrieval

| S/No | Descriptions               | Frequency | Percent |
|------|----------------------------|-----------|---------|
| 1    | Questionnaires Distributed | 792       | 100.0   |
| 2    | Questionnaires Retrieved   | 714       | 90.2    |
| 3    | Valid Questionnaires       | 645       | 81.4    |

Source: Field Survey, 2026

Table 2 showed that 792 questionnaires were sent to the workers of the selected construction companies in South-South, Nigeria. A total of 714 (90.2%) of the 792 questionnaires sent were retrieved. 645 (81.4%) of the questionnaires were found suitable for analysis. The retrieval and validity rate shows good respondent participation and cooperation which attested to the reliability and validity of the findings of the study.

**Table 3** Demographic Results

|                        |                  | Frequency  | Percent      | Valid Percent | Cumulative Percent |
|------------------------|------------------|------------|--------------|---------------|--------------------|
| Gender                 | Female           | 286        | 44.3         | 44.3          | 44.3               |
|                        | Male             | 359        | 55.7         | 55.7          | 100.0              |
|                        | <b>Total</b>     | <b>645</b> | <b>100.0</b> | <b>100.0</b>  |                    |
| Age                    | 20-35            | 72         | 11.2         | 11.2          | 11.2               |
|                        | 36-50            | 481        | 74.6         | 74.6          | 85.7               |
|                        | 51 and above     | 92         | 14.3         | 14.3          | 100.0              |
|                        | <b>Total</b>     | <b>645</b> | <b>100.0</b> | <b>100.0</b>  |                    |
| Marital Status         | Married          | 543        | 84.2         | 84.2          | 84.2               |
|                        | Separated        | 18         | 2.8          | 2.8           | 87.0               |
|                        | Single           | 84         | 13.0         | 13.0          | 100.0              |
|                        | <b>Total</b>     | <b>645</b> | <b>100.0</b> | <b>100.0</b>  |                    |
| Educational Attainment | HND/Bachelor     | 465        | 72.1         | 72.1          | 72.1               |
|                        | Master and above | 142        | 22.0         | 22.0          | 94.1               |
|                        | WAEC/OND         | 38         | 5.9          | 5.9           | 100.0              |
|                        | <b>Total</b>     | <b>645</b> | <b>100.0</b> | <b>100.0</b>  |                    |

Source: SPSS 28.0 Output

The results of the gender distribution revealed that 359 (55.7%) of the respondents were males and 286 (44.3%) of the respondents were females. This discovery indicates that the construction industry are dominated by male employees in the South-South. As for age distribution, 481 respondents (74.6%) were in the age range of 36-50 years, 92 respondents (14.3%) aged 51 and above and 72 respondents (11.2%) aged 20-35 years. The result shows that majority of the respondents were experienced and had good awareness of project management processes and activities in their organisations.

When marital status was examined, majority of the respondents 543(84.2%) were married, 84 (13.0%) were single while 18 (2.8%) were separated. There were a relatively high percentage of married respondents indicating that there is a stable labour force with a good amount of work and life experience. Concerning educational qualification, 465 (72.1%) respondents had HND or Bachelor's degree, 142 (22.0%) respondents had Master's degree and above while 38 (5.9%) respondents had WAEC or OND qualification. The relatively high percentage of tertiary education in the respondents indicates that the respondents were well educated and knowledgeable enough to respond to the questions on project management strategies and operational efficiency.

**Table 4** Spearman Correlation Results

| Correlations   |                        |                         |                        |                  |                  |                  |                  |                     |
|----------------|------------------------|-------------------------|------------------------|------------------|------------------|------------------|------------------|---------------------|
|                |                        |                         | Operational Efficiency | Project Planning | Project Cost Mgt | Project Risk Mgt | Project Time Mgt | Project Quality Mgt |
| Spearman's rho | Operational Efficiency | Correlation Coefficient | 1.000                  | 0.346**          | 0.563**          | 0.436**          | 0.355**          | 0.720**             |
|                |                        | Sig. (2-tailed)         | .                      | 0.000            | 0.000            | 0.000            | 0.000            | 0.000               |
|                |                        | N                       | 645                    | 645              | 645              | 645              | 645              | 645                 |
|                | Project Planning       | Correlation Coefficient | .346**                 | 1.000            | .509**           | .440**           | .329**           | .302**              |
|                |                        | Sig. (2-tailed)         | .000                   | .                | .000             | .000             | .000             | .000                |
|                |                        | N                       | 645                    | 645              | 645              | 645              | 645              | 645                 |
|                | Project Cost Mgt       | Correlation Coefficient | 0.563**                | 0.509**          | 1.000            | 0.570**          | 0.469**          | 0.574**             |
|                |                        | Sig. (2-tailed)         | 0.000                  | 0.000            | 0.               | 0.000            | 0.000            | 0.000               |
|                |                        | N                       | 645                    | 645              | 645              | 645              | 645              | 645                 |
|                | Project Risk Mgt       | Correlation Coefficient | 0.436**                | 0.440**          | 0.570**          | 1.000            | 0.602**          | 0.470**             |
|                |                        | Sig. (2-tailed)         | 0.000                  | 0.000            | 0.000            | 0.               | 0.000            | 0.000               |
|                |                        | N                       | 645                    | 645              | 645              | 645              | 645              | 645                 |
|                | Project Time Mgt       | Correlation Coefficient | 0.355**                | 0.329**          | 0.469**          | 0.602**          | 1.000            | 0.476**             |
|                |                        | Sig. (2-tailed)         | 0.000                  | 0.000            | 0.000            | 0.000            | 0.               | 0.000               |
|                |                        | N                       | 645                    | 645              | 645              | 645              | 645              | 645                 |
|                | Project Quality Mgt    | Correlation Coefficient | 0.720**                | 0.302**          | 0.574**          | 0.470**          | 0.476**          | 1.000               |

|                                                                                     |  |                 |       |       |       |       |       |     |
|-------------------------------------------------------------------------------------|--|-----------------|-------|-------|-------|-------|-------|-----|
|                                                                                     |  | Sig. (2-tailed) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.  |
|                                                                                     |  | N               | 645   | 645   | 645   | 645   | 645   | 645 |
| **. Correlation is significant at the 0.01 level (2-tailed). Source: SPSS Output 25 |  |                 |       |       |       |       |       |     |

Results showed that there was a positive and significant relationship between the project planning and operational efficiency ( $r = 0.346$ ,  $p = 0.000$ ). The correlation coefficient showed that there is moderate level of positive correlation that project planning is associated with effective utilization of organizational resources and project execution. The results also showed that the correlation coefficient value between project cost management and operational efficiency was  $r = 0.563$  with  $p = 0.000$  which is positive and significant. This entails a moderately positive correlation. It shows that successful budgeting, cost management and financial monitoring helped to make firms operations more efficient. Also, project risk management had a positive and significant relationship with operational efficiency ( $r = 0.436$ ,  $p = 0.000$ ). The moderate positive correlation indicates that projects with better identification, assessment and mitigation of risks, are more likely to operate well and have a lower level of disruption in the project implementation.

The results of the analysis also showed that there was a positive and significant correlation between project time management and project operational efficiency ( $r = 0.355$ ,  $p = 0.000$ ). The relationship was moderate but it may be said that successful project scheduling, monitoring and completion of project activities had significant impact on enhancing project operation. Finally, the highest positive correlation was project quality management - operational efficiency ( $r = 0.720$  at  $p = 0.000$ ). The correlation coefficient indicates that there was high degree of positive correlation, which means that the use of the norms of quality, quality assurance practices and continuous quality improvement made a significant contribution to the improvement of the operational efficiency.

## 5. Discussion of Findings

The results of the Spearman Rank correlation analysis showed that there was a positive and significant relationship between project planning with operational efficiency ( $r = 0.346$ ,  $p < 0.01$ ). The result indicates that the construction of project planning practices contributed to improving the efficiency of the construction companies in the South-South Nigeria region. Proper project planning can be used to identify project goals, allocate resources to the project, develop project schedules and coordinate project activities, minimizing uncertainties and operational bottlenecks. The finding is in line with the theory of project management that successful project results are obtained by systematic planning and coordination of project tasks (Project Management Institute [PMI] 2021; Kerzner, 2022). The result is corroborated with empirical findings by Adeleke et al. (2018) which showed that good project planning results in good project performance and operational results in construction organizations. Furthermore, Ugwu et al. (2020) found a significant influence of planning effectiveness on project delivery success and productivity of the organisation in the Nigerian construction industry.

The study also revealed that there was a positive and significant relationship between project cost management and operational efficiency ( $r = 0.563$ ,  $p < 0.01$ ). The result shows that good budgeting, cost estimation, expenditure monitoring and financial control mechanisms positively influenced the level of operation performance of construction companies. Cost management is to ensure the best allocation of the organization's resources, avoid wasting resources and prevent exceeding the budget, thereby affecting the project's implementation. It corroborates the assumption of resource-based view model that the organizations attaining high performance are the ones that could successfully exploit valuable organizational resources and capabilities (Barney, 1991; Wernerfelt, 1984). This result is consistent with the result of Hwang and Ng (2013) which states that the successful cost management has a great impact on construction project success and efficiency of the project operation. Similarly, Kerzner (2022) claimed that those who can control the cost of their projects more efficiently are likely to be more efficient and hence be able to obtain a competitive advantage.

The results also showed that the project risk management had positive and significant correlation with operational efficiency ( $r = 0.436$ ,  $p < 0.01$ ). This finding indicates that risk identification, risk assessment and risk mitigation were done in the project, which has improved the performance and outcome of the project. Any type of construction project can have uncertainties with regards to financial issues, technical failures, regulatory changes, and environmental issues. By effectively managing risks, organizations can foresee potential problems and take proactive steps to mitigate the negative impact. This finding was in line with the systems theory which considers organisations as interdependent systems and a change in one of the systems can cause the whole system to change (Bertalanffy, 1968; Kerzner, 2022). The result is in line with the result obtained by Adeleke et al. (2018) who found that construction companies with proper RM practice were found to have improved project performance and operational effectiveness of the company. Likewise,

Marcelino-Sádaba et al., (2014) concluded that risk management exercised a very important function for the success of a project since it helps to minimize uncertainties and increases the resilience of the organisation.

The analysis results also indicated that there was a positive relationship between operational efficiency and project time management with a coefficient of 0.355 and significant value of  $< 0.01$ . This finding implies that good scheduling, activity sequencing, project progress monitoring and timely completion of projects helped in improving operational efficiency of construction companies. Although one of the most important parts in a successful project, time management is still one of the most challenging. It can be confronted with project cost overruns, wastage or customer dissatisfaction if a project is over scheduled. This is aligned with the project management theory which sees schedule management as one of the basic processes of the project management field, helping to achieve project objectives and improve organisational performance (PMI, 2021; Kerzner, 2022). This also agrees with the study carried out by Doloi et al. (2012) that concluded that by effective management of project schedule, the delays of the project can also be minimised and construction project results can also be enhanced. Similarly, Ugwu et al. (2020) showed that timely execution of project positively affected the productivity of construction firm in Nigeria and their operational efficiency.

Project quality management was substantially positive in relation with operational efficiency ( $r = 0.720$ ,  $p < 0.01$ ). This result revealed that quality management practices had the most impact on operational efficiency out of all the project management strategies explored. This is because quality management helps to ensure that the project meets the quality specifications, the number of defects is kept to a minimum, rework is reduced, and stakeholders are satisfied. This finding is in line with systems theory, which highlights the need for the integration and coordination of all components of the operation to produce quality outputs (Bertalanffy, 1968; Kerzner, 2022). The result also supports the resource-based view that considers the quality management capabilities as strategic organizational resources which can lead to superior performances and sustainable competitive advantage (Barney, 1991; Wernerfelt, 1984). The results agreed with those of Oakland (2014) who reported that the adoption of QMPs in a considerable manner helps to improve the operational performance and organizational competitiveness. Likewise, Love et al. (2016) indicated that with good quality management, the failures of the projects were reduced and productivity increased in the construction organizations.

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## 6. Conclusion

The study concluded that project management strategies had a significant influence in the operational efficiency of construction companies in South-South Nigeria. The results indicated that these variables: project planning, project cost management, project risk management, project time management and project quality management were positively and significantly related to operational efficiency. Project quality management had the highest impact on operation efficiency followed by project cost management, project risk management and project time management as well as project planning. Effective implementation of project management strategies was identified and confirmed to provide better use of resources, operational inefficiencies minimization, better project delivery and organizational performance.

### 6.1. Limitations of the Study

There are several factors that limit this study:

- i. This study made use of cross-sectional research design. This may have constraints in establishing causality between the variables.
- ii. This research relied solely upon self-reported data. Data collection instruments were questionnaires, which might involve the possible respondent bias, social desirability bias and subjective interpretation of the data.
- iii. The study focused only on selected construction organisations in South-South Nigeria. Thus, the result obtained in the study cannot be completely generalised to construction organisations in other regions of Nigeria and/or other countries with different operating environment.

### 6.2. Recommendations

- i. Management of construction firms should ensure that every project has a clear objective and detailed work breakdown structure. This will ensure a realistic schedule plan for resources allocation and communication with stakeholders. Project planning units should perform feasibility studies and regular planning reviews to make sure that project execution is consistent and support organizational objectives and needs. This will minimize uncertainties, boost coordination and increase operational efficiencies.
- ii. Construction companies should have cost control units in place to monitor, manage project expenditures, calculate cost deviation, and take necessary corrective actions in a timely manner. This will ensure the periodic review of resources for projects in order to avoid any over-budgeting and wastage of resources.

- iii. Management should make use of its project risk management committee in establishing and registering all the risks affecting its projects. The ability to identify, assess, and prioritize all these risks will aid in managing them throughout the life of the project. Also, there is need for construction firms to engage actively in risk management training such as workshops, seminars and online courses to enhance their project managers and operational personnel's skills in identifying and managing project risks before they become critical issues.
- iv. Construction companies need to improve their project time management by making use of digital project tracking and scheduling tools like Primavera P6 or Microsoft Project. Project Managers should also conduct periodic reviews of the project schedule, monitor project milestone achievements and take appropriate action as necessary to address issues that are causing projects to delay.
- v. Construction companies should pay attention to building a good quality management system. During the project implementation, quality assurance and quality control should be set up and implemented by the management. To minimize the defect and rework and enhance project results, continuous inspections, quality audits, compliance assessments and employee quality training programs should be institutionalized.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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