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Factors Affecting Project Performance of Building Construction Projects in Federal Capital Territory (FCT) Abuja, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors SEBO, AMI and BBO contributed to the design and implementation of the research, to the analysis of the results and the writing of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aim: This study identifies factors that influence construction project performance, evaluated the factors and examined the impact of these factors with a view to help owners, consultants, and contractors overcome performance problems and improve construction project performance and recommend modalities for enhancing the effective implementation of construction project objectives.
Study Design: A cross-sectional questionnaire survey was adopted in this study.
Place and Duration of Study: Purposive sampling technique was used to elicit 100 copies of questionnaires from contractors, architects, clients, engineers and builders in Federal Capital Territory, Abuja, Nigeria between June 2019 and April 2022.
Results: The data was analysed using frequency, percentile, and relative importance index (RII) to rank factors. The results show that the top three cost-factors affecting project performance are escalation of material prices, design changes, and discrepancies in contract documents; the top three time-factors that affect project performance are: non-availability of resources as planned throughout project, slow decision making and time required to implement variation orders; the top three quality-factors affecting project performance are the availability of experienced and qualified personnel, deficiencies in coordination and lack of managers involvement in decision making. The

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study also revealed that, the top three factors for "others" category of factors that influence project performance are frequent staff development; good staff motivation and staff attitudes on the project. Finally, the study revealed the top three modalities to ensure effective project performance: frequent progress reviews; comprehensive contract management and dedicated leadership and management.

Conclusion: The paper shows among others that the factors affecting project performance are rising material prices, design changes, discrepancies in contract documents and slow resource availability as planned throughout the project. To ensure effective implementation of construction project objectives in the industry the study recommends among other things that stakeholders need to have a clear mission and vision to formulate, implement and evaluate their performance. Also, regular progress reviews should be carried out to ensure that clear decisions are made timely to ensure construction process proceeds as planned.

Keywords: Project performance indicators; construction projects; project performance; construction industry.

1. INTRODUCTION

Performance Indicators are measurable indicators of project success. They are selected to determine performance, provide details to decision-makers to measure it against intended deliverables and outcomes, and carry critical success factors for the project [1]. Argue that construction projects are done to achieve specific outcomes, and other goals of the project are on-time completion, specific budget, specific quality, etc. These goals will be the benchmark for any project. The success of a project can be described as achieving the goals set in the project plan. Therefore, a successful project can be considered a project that has achieved its technical performance, met its schedule, and was run within budget. The success or failure of a project depends on its performance. Time, cost, quality goals, and stakeholder satisfaction are the most important parameters for assessing project success in project management [2,3] asserted that the performance of the construction industry is considered to be a source of concern for public and private customers. [4] studied performance measurements using key performance indicators (KPIs). KPIs include factors such as time, cost, quality, customer satisfaction, customer change, business performance, and safety, can measure the performance of projects and organizations across the construction industry.

Postulated that construction planning is an important factor in ensuring that projects are carried out on budget and on schedule [5,6]. Noted that, project performance is an important issue for the construction industry and project outcomes such as on-time completion and customer satisfaction are often used as a measure of success. The construction industry is complex in nature and involves a huge number of stakeholders, including clients, contractors, consultants, shareholders and regulatory agencies. Construction projects suffer from many difficulties and multiple performance issues, some of which are related to cost, time, quality and safety.

According to [7] one of the most pressing concerns in the construction industry in most developing countries is the surprising rate of project delays and cost overruns. Overtime happens when each phase of the project takes longer time, than specified in the work plan and this can be defined as the project failing to complete within the target time frame or contract schedule. The failure can be as a result actions caused by either of the party or a direct result of one or more situations [8].

Described the factors that influence the cost and time performance of construction projects as Critical Success Factors (CSFs) [9,8] evaluated 8,000 projects and found that only 16% of the total number of projects met the three well-known performance criteria of completing a project within budgeted cost, time, and quality [7]. Observed that the average cost overrun for Nigerian projects is at least 14%, the average time overrun is 188%, and the average dissertation is only 96% [8]. Concluded that 9 out of 10 projects face cost overrun. Previous researches (KPI report, 2000; [10-14] have shown that project failures are primarily related to performance issues. Therefore, a common problem reported in the construction industry around the world is cost and time overruns.

Nigeria is not an exception to this problem as it is characterized by cost and time overrun [15,2].

A good number of comprehensive researches have been carried out in other countries to explain why construction project performance is a critical issue in the construction industry [16,13,1,17,8,12]. Other researchers [18,7,3,19] in Nigeria have also done their study on construction project performance in different states but not exhaustively in Federal Capital Territory (FCT). This paper therefore seeks to analyse the factors affecting the performance of the building construction projects in Federal Capital Territory (FCT), Nigeria. And also, to examine control measures to ensure effective implementation of construction project objectives in the building construction industry in Nigeria.

1.1 Concepts of Project Performance

Project success can be described as the attainment of goals dictated by the project plan. Therefore, a successful project can be depicted as a project that has attained its technical performance, sustained its schedule and executed within budgeted cost. Project success is related to cost, quality and time, and client needs are usually within these criteria [20]. Excess of time can lead to excess of cost, which is a global phenomenon [8].

Various researchers have developed alternative frameworks to measure the success of a project [21]. Recommended measuring process implementation, project apparent value, and customer satisfaction at the end of the project [22]. Proposed a comprehensive framework for assessing the success of a project, they suggested that the success of the project should be evaluated against short-term and long-term goals. The framework includes: efficiency (completion of the project within the planned time and cost); customer interests from the final product; business success and Future plans (market opportunities).

1.2 Cost Performance

Cost is one of the most important considerations throughout the project management life cycle, one of the key important parameters of the project, and can be seen as the driving force behind the success of the project [23]. Stated that cost performance analysis has four cost-related measurements used to analyze the cost performance of a project [24]. This metric is used to assess whether a project is running within budget or is in line with actual costs. The four cost-related metrics are TBC (total budget cost), CBC (cumulative budget cost), CAC (cumulative actual cost), and CEV (cumulative earned value). The cost of a construction project can be described as the total cash dedication required to carry out a construction project such as a building.

Cost overruns occur when the final cost or expense of a project exceeds the originally estimated cost. [25,26] pointed out that cost overrun is one of the major problems in the construction industry [27]. Stated that the biggest contributor to cost overruns is an inaccurate estimate of the initial costs of a project [28]. Discovered that cost inflation in a project leads to increased costs. Inflation in materials, equipment and labour costs can vary geographically from country to country, and subcontracting contracts with suppliers may include various inflation protection terms agreed with the client [16]. Argued that improper planning and limited management experience cause errors in the use of technical data [5]. Noted that high machine costs are one of the market-related problems. In order to obtain project approval for the project, some stakeholders deliberately underestimate the cost of the project.

Among the factors identified by [18] as factors impacting cost and time include price fluctuations, inaccurate estimates, delays (overtime), extra work, fraudulent practices and kickbacks, and shortened construction methods. Poor contract management, subcontractors and designated suppliers, construction and breach of contract terms [17]. Argued that payment delays can occur due to the complex financial processes of client's organization. Delayed payments create financial difficulties for the contractor and delay the schedule for completing on-site work [17]. Stated that contractors, consultants, and clients need to have the right staff with the right qualifications to manage their projects efficiently [25]. Stated that one of the client's requirements associated with construction projects is the estimate of expected costs. Proper cost management is important because it follows the general trend towards improved economics and guarantees construction costs not only in the context of initial costs, but also in terms of life cycle costs or total cost considerations.

Suggested an approach to avoid cost overrun, they opined that every development project should include a certain number of risks [27].

Therefore, in order to determine and mitigate the risk of each project, the project manager had to perform risk management functions. [16] corroborated, that sufficient reserves ought to be available for emergencies to cover the increase in material costs due to inflation. The accuracy of the cost estimates allows clients to validate the funds needed to carry out the project and make them available as needed [17]. Asserted that efficient management is important for creating a productive and cost-effective site [29].

1.3 Time Performance

Time performance is another major primary parameter used in measuring success of construction projects. According to [30] extension of time could be defined as the time overrun both beyond ending date designated in a contract, or beyond the date that the parties agreed on, on the delivery of the project [31]. Stated that time extension can be defined as exceeding both end dates specified in the contract and the date agreed between the parties to carry out the project [32]. Noted that the occurrence of timeouts has a negative impact on development plans. Time overrun causes many negative effects, including proceedings between the owner and the contractor, increased costs, lost productivity and revenue, and termination of contracts [33].

Agreed that different factors have been identified by different researchers in relation to different aspects of time in the construction industry [34,35]. Identified the five most important factors influencing time management in the Nigerian construction industry. They are material shortages, rework, equipment, delays in supervision, absenteeism, and interfaces [15]. Also identified the main causes of overtime in the Nigerian construction industry as how to finance and pay for completed construction; improper planning of projects and underestimation of time/duration; lack of materials; weather and physical site conditions; lack of proper tools and equipment; delays in design inspections; ordering drawings and changes; absences, safety, improper planning.

One of the basic requirements for a successful construction project is that the project must be completed within the contract periods. Good planning and good customer payments are the basic remedies to avoid time-outs [33]. Suggested that timeouts can be avoided or minimized if the cause is clearly identified [36].

1.4 Quality Performance

Quality is defined as conformance to established requirements, with requirements being the characteristics of the product, process, or services specified by the contracts [37]. The consistent delivery of results that are fit for a defined or agreed-upon purpose is referred to as "quality." As a result, "performance" is the attainment of quality. The fulfilment of a customer's demands and expectations must be transformed into precisely specified and quantifiable requirements for building construction projects [38]. The focus of quality-based performance measurements is on factors like the quantity of defects created and the cost of quality [39].

The effectiveness of a project is evaluated based on its timeline, adherence to quality standards and cost control [40]. Project performance or success can be defined as the achievement of project-specific goals. As a result, a successful project is one that has met its technical objectives, stayed on schedule, and was completed within budget.

2. METHODOLOGY

This paper assessed the factors that influence performance of building construction projects in the Nigerian construction industry. To identify the factors influencing the performance of building construction projects in Nigeria, a careful review of the literature was conducted and a good number of a factors were identified [28,18,35,15,26,16,5,27,41]. The identified factors collated from the comprehensive literature review were used as a basis for this study. The study was conducted in Federal Capital Territory (FCT). FCT was chosen because it has a large concentration of contractors of all sizes and types, as well as a high volume of building projects. FCT is also a crucial location for Nigeria's economy. The methodology is highly useful for reaching out to populations that are not easily accessible. Questionnaire survey was used to gather data for the study. The total population for the study was 178 which comprised of building projects' professionals from a variety of backgrounds registered with their professional bodies; architects, quantity surveyors, engineers, and builders, including clients and contractors [42]. Formula was used to determine the sample size which was 123. Random sampling technique was employed for qualified and experienced project

professionals. A total number of 123 questionnaires were distributed to respondents, with 100 returned and fit for analysis. Before distributing the research instrument to the respondents, a pilot study was conducted on it to assess its thoroughness and correctness. The study's questionnaire was divided into two parts. While section two focused on matters relating to the project objectives, section one tried to learn more about the participants' backgrounds. Questions inherent in the structured questionnaire were multiple-choice type with different checkboxes and tables posed on a 5-point Likert-type scale for ease and uniformity of responses. Data obtained were analysed using frequency, percentile and relative importance indexes (RII).

Table 1 shows Cronbach's reliability test that was used to test the reliability of the questionnaire. [40] noted that for all the items of an instrument to be internally consistent and reliable, the result of the reliability must produce a minimum Cronbach's Alpha of 0.7. In this study all the items of the two variables were subjected to reliability test. The results with reference to [40] suggested that all the items were good and consistent internally because the Cronbach's Alpha coefficient for the items were 0.7 and above.

3. RESULTS AND DISCUSSION

Table 2 presents the breakdown of the professions of the respondents. The results indicated that quantity surveyors formed the highest number (25%) among the respondents while clients formed the lowest number (9%).

Table 3 displayed the working experience of the respondents. The mean years of working experience of respondents is approximately 11, which depicts that they are competent enough to supply reliable and up to date data needed for the study.

Table 4 shows the academic qualification of the respondents. The results indicate that M. Sc. formed the highest number (44%) among the respondents while Ph.D. formed the lowest number (15%).

Table 1. Test of reliability for measuring scale

Scale of Measure	Cronbach – Value
Identified Factors Affecting Project Performance	0.899
Control Measures for Factors Affecting Project Performance	0.901

Table 2. Profession of respondents

Category	Frequency	Percentage %
Quantity Surveyors	25	25%
Builders	20	20%
Architects	18	18%
Engineers	17	17%
Contractors	11	11%
Clients	9	9%
Total	**100**	**100%**

Table 3. Respondents years of experience

Years of Experience	Frequency	Percentage %
1 – 5	22	22%
6 – 10	43	43%
11 – 15	15	15%
16 – 20	14	14%
Over 21	6	06%
Total	**100**	**100%**

Table 4. Respondents academic qualifications

Academic Qualification	Frequency	Percentage %
M.Sc.	44	44%
B.Sc.	22	22%
HND	19	19%
Ph.D.	15	15%
Total	**100**	**100%**

Table 5. Cost factors affecting project performance

Factors	RII	RANK
Escalation of material price	0.899	1
Design changes	0.874	2
Discrepancies in contract document	0.839	3
Project design cost	0.801	4
Profit rate of project	0.801	4
Frequent equipment breakdown		
Poor contract management	0.799	6
Ignorance on the part of the designer about client requirement	0.798	7
Cost of variation orders	0.795	8
Incomplete drawings	0.794	9
Monthly payment difficulties	0.790	10
Construction methods	0.788	11
Change in site conditions	0.783	12
Fraudulent practice	0.780	13
Overhead percentage of project	0.777	14
Weather	0.765	15
Poor contract management	0.753	16
Deficiencies in cost estimates	0.739	17
Cost of rework	0.731	18
Labour and management relation	0.722	19

Table 6. Time factors affecting project performance

Factors	RII	RANK
Non-availability of resources as planned through project duration	0.820	1
Slow decision making	0.811	2
Time needed to implement variation order**s**	0.800	2
Insufficient number of equipment	0.794	4
Planning and scheduling deficiencies	0.786	5
Delay in payment approval by the project owner	0.763	6
Late delivery	0.759	7
Time needed to rectify defects	0.757	8
Satisfaction with the quality	0.741	9
Insufficient equipment	0.688	10

Table 7. Quality factors affecting project performance

Factors	RII	RANK
Non-availability of personnel with high experience and qualifications	0.869	1
Deficiencies in coordination	0.802	2
Manager's non-involvement in decision making	0.787	3
Errors during constructions	0.787	3
Material management problems	0.779	5
Non-conformance to specifications	0.744	6
Inadequate control procedures	0.732	7
Shortages of technical personnel	0.711	8

Table 5 shows the cost factors affecting project performance. Escalation of material price was ranked 1st with RII of 0.899, followed by design changes with RII of 0.874, next to it was discrepancies in contract documents which was ranked 3rd, Project design cost was ranked 4th, however, profit rate of project was ranked 5th. The positions of other factors are as shown in the table.

Table 6 shows time factors affecting project performance. The results show that non-availability of resources as planned through project duration ranked 1st with RII of 0.820, the 2nd position was occupied by slow decision making with RII of 0.811, next is time needed to implement variation orders with RII of 0.800, insufficient number of equipment ranked 4th with RII of 0.794, planning and scheduling deficiencies was 5th with RII of 0.786, others are delay in payment approval by the project owner; late delivery; time needed to rectify defects; satisfaction with the quality and insufficient equipment were ranked 6th ,7th ,8th ,9th and 10th respectively.

Table 7 shows quality factors affecting project performance of building construction projects. The highlights indicated that non-availability of personnel with high experience and qualifications is a major factor affecting quality and this had RII of 0.869, followed by deficiencies in coordination, participation of managerial levels with decision making, errors during constructions, material management problem, conformance to specification, inadequate control procedures and shortage of technical personnel and their accompanied RIIs as represented in the table below.

Table 8 analysed the responses of the professionals with regards to others factors affecting project performance. The result indicated that non development of employees is a major factor affecting project performance and this recorded RII of 0.817, followed by no motivation of dedicated employees, employee attitudes on projects, management-labour relationship, project complexity, sequencing of work according to schedule, number of non-compliance to regulations, neighbours and site conditions, climate condition on site**,** information coordination between owner and project parties.

According to Table 9 the major control measures needed to ensure effective project performance is frequent progress meeting with RII of 0.888. This was followed by comprehensive contract administration with 0.834, the 3rd was committed leadership and management with RII of 0.822, the rest were the use of appropriate construction methods, focus on client's need and others as shown in the table.

4. DISCUSSION OF FINDINGS

All the identified factors rated by the respondents were found to be significant through relative importance index (RII). From the analysis it could be seen that the pervasiveness of factors affecting construction project performance has been an issue of great concern in the construction industry. The analysis shows that escalation of material price, design changes and discrepancies in contract document were the top three cost factors affecting project performance. This result is in agreement with the study of [28]), that cost inflation in a project leads to increase costs. The result also corroborated the work of [18] when they asserted that factors impacting cost and time include price fluctuations, inaccurate estimates, delays (overtime), extra work, fraudulent practices and kickbacks, and shortened construction methods. [27] added, that cost inflation in a project and inaccurate estimate of the initial costs of a project leads to increase costs. Non-availability of resources as planned through project duration, slow decision making and time needed to implement variation orders were the top most time factors affecting project performance. This finding confirmed the study of [16] that improper planning and limited management experience cause errors in the use of technical data. For quality performance, non-availability of personnel with high experience and qualifications, deficiencies in coordination and non-involvement of managers in decision making were the top three factors. Less frequent development of employees, no motivation for dedicated employees and employees' attitude on projects were the top "others" factors. Similarly, the study agrees with the study of [19] who concluded in their work that the overall success of a project is determined to a large extent by the proper management of resources which are considered as essential aspect of project implementation. They went further to say that if the resources are adequately used and controlled, issues related to cost overrun would not arise. The results of the study compared fairly well with the previous studies.However, there was a little deviation in the results with the study of [35]) which concluded that the five most important factors influencing time management in the Nigerian construction industry are material shortages, rework, equipment, delays in supervision, absenteeism, and interfaces [15].

Table 8. "Others" Factors affecting project performance

Factors	RII	RANK
Less frequent development of employees	0.817	1
No motivation for dedicated employees	0.771	2
Employees attitudes on projects	0.771	2
Management-labour relationship	0.766	4
Project complexity	0.763	5
Sequencing of work according to schedule	0.754	6
Number of non -compliance to regulations	0.754	6
Neighbours and site conditions problems	0.754	6
Climate condition on site	0.751	9
Information coordination between owner and project parties	0.744	10

Table 9. Control measures to ensure effective project performance

Measures	RII	RANK
Frequent progress meeting	0.888	1
Comprehensive contract administration	0.834	2
Dedicated leadership and management	0.822	3
Use of appropriate construction methods	0.805	4
Focus on client's need	0.799	5
Use of up-to-date technology utilization	0.792	6
Close monitoring	0.755	7
Use of experienced subcontractors and suppliers	0.740	8
Training and development of all participants	0.738	9
Focus on the quality, cost and delivery of the project	0.724	10
Hire skilled workers	0.711	11

Identified how to finance and pay for completed construction, improper planning of projects and underestimation of time/duration as the main causes of overtime in the Nigerian construction industry.

In assessing the possible ways of effectively implementing construction projects' objectives in the building construction industry, the following measures in Table 9 were identified and ranked according to their level of significance. Frequent progress meeting, comprehensive contract administration and dedicated leadership and management were noted as the most important control measures needed to ensure effective project performance. The results aligned well with previous studies [29,30] when they asserted that efficient management is important for creating a productive and cost-effective site.

5. CONCLUSION

Construction project performance is a global concern measured in all projects. The paper explored the factors that affect project performance. It was revealed among others that the factors affecting project performance are rising material prices, design changes, discrepancies in contract documents, slow resource availability planned throughout the project, time required to implement change orders, unavailability of experienced and qualified personnel, lack of coordination, manager involvement in decision making, and construction work errors. The paper also concluded that the other top three factors that influence project performance are frequent staff development, good staff motivation, and staff attitudes on the projects.

In light of the findings, discussions and conclusions, the following recommendations are suggested: stakeholders in the industry need to have a clear mission and vision to formulate, implement and evaluate their performance; construction professionals and customers should strive to properly take market price inflation into account when developing the quantity table (BOQ); drawings must be completed and contract management agreed upon projects commence; resources needed should be readily available for the duration of the project; regular progress reviews should be carried out to ensure that clear decisions are made timely to ensure construction process proceeds as planned; greater efforts should be made to regularly train and properly motivate staff to be up-to-date with latest developments and practices in the

construction industry. The use of proper construction methods should also be encouraged.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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