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PERCEPTIONS OF STAKEHOLDERS ON THE IMPACTS OF COST MANAGEMENT SUCCESS FACTORS ON PUBLIC BUILDING CONSTRUCTION PROJECTS IN THE SAHEL REGION: EVIDENCE FROM YOBE STATE

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Abstract — The Sahel region is continuously in the spotlight due to issues related to precarious security situations, political instabilities, high refugees and internally displaced persons, and climate change crises. For decades, the activities of various non-state organizations in the region have led to devastating consequences to its built environment. For instance, in Nigeria, a Sahel nation, the cost of damages and destructions to its public infrastructures due to conflicts and climate-related issues in its extreme North-Eastern Sahelian states is estimated at a cost of USD 9.2 billion, while about USD 6 billion is needed for recovery, repairs and reconstruction. It is therefore pertinent that all necessary measures should be taken to reduce tendencies of cost overrun during the implementation. Hence, this study evaluated the perceptions of stakeholders on the impacts of cost management success factors on public building construction projects in the Sahel region. The study is limited in scope to the Anglophone-speaking part of the region with Yobe State, Nigeria as a case study. A descriptive survey was employed to elicit responses, and a structured questionnaire was used to collect data. A convenience sample of 150 samples was distributed to the accessible construction professionals in the study area through a multiple snowball sampling technique point. SPSS version 24.0, a social science statistical tool was used for data analysis. Findings revealed that 62.7% of the stakeholders have encountered cost overrun in a range of 5-25% at most during construction project delivery in the region. In addition, all the success factors assessed have 'high or moderate' impacts on public building construction projects. Major findings revealed that the success factors with a 'Relative Severity Impact' in a range of 70.85-74.24% on public building construction projects are project planning and monitoring, taking adequate security and climate change measures, project manager's technical competence, project team technical abilities, and project manager's previous work experience. Furthermore, the stakeholders were in concordance with their perceptions of the success factors, which was significant. In conclusion, cost overrun is a pertinent issue in the Sahel region. This present study delved more into cost management success factors, which are unique to the built environment devasted with issues related to insecurity and climate change.

***Keywords*:** cost management, public building project, Sahel region, success factor, insecurity, climate change

1.0 INTRODUCTION

The National Bureau of Statistics has reported that the fourth quarter of 2022 saw a rise of 8.9 trillion Nigerian Naira (NGN) in the contributions of the construction sector, including real estate, to Nigeria's Gross Domestic Product [1]. The survey also revealed that in the fourth quarter, the real estate sector contributed NGN 3.1 trillion to the GDP, while the construction sector generated NGN 5.7 trillion on its own. Despite problems in the year 2022 under review, including, rising loan rates, inflation, and the cost of building materials, the sector's GDP contribution increased to NGN 28.9 trillion [2], and 9.38% of the sector's overall contribution was nominal in the year 2022.

Before a project is completed, the expected expenses of all resources, including labour, materials, plants and machinery, earnings, and overheads are estimated. As such, an initial estimate on expected overall cost is essential, and can be achieved through effective cost management. In order to finish the project within the

allocated budget, project cost management encompasses all the procedures involved in planning, estimating, budgeting, financing, funding, managing, and controlling costs [3]. In addition, the cost of the resources required to accomplish project activities is the main focus of construction project cost management.

The Sahel region has been plagued by the activities of various insurgent groups for years, particularly in the Northern Mali and in North-Eastern Nigeria, which has snowballed to neighbouring countries. These activities have devastating effects on human, physical, social, and economic sectors. For instance, the Federal Republic of Nigeria has established the Multi-National Joint Task Force (MJTF), a military organization with its headquarters in Maiduguri, the capital of Nigeria's state of Borno, to address the issue of insecurity in its extreme North-Eastern region states. Member nations of the military outfit includes the Republic of Cameroun, Chad, Nigeria, Niger, and the Republic of Benin. Moreover, Nigeria has decided to host the Sahel climate fund secretariat in order to combat the negative effects of climate crisis in the region [4]. In order to promote cooperation and coordinate actions amongst the Sahel Region Climate Commission member countries, the Sahel Climate Fund seek to mobilize all the necessary resources from member states, bilateral and multilateral partners, and the private financial institutions [4]. The causes of insurgency, climate change, and their impacts on construction project delivery in the Sahel region, however, are outside the purview of this present study.

According to Africon [5], every project's price would largely depend on the local conditions and demands. According to estimates from the World Bank [6], Nigeria's North-Eastern region states of Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe State have suffered damages and destruction to their infrastructures, costing about USD 9.2 billion, while the region's public infrastructure recovery and reconstruction will likely cost USD 6 billion. Thus, it is important to take all necessary precautionary measures to reduce any possible tendencies of cost overrun during the implementation period, by deploying ideal success factors in light of the aforementioned issues, particularly due to the enormous estimated cost to be incurred for reconstruction and or repair of physical, social, and productive infrastructures damaged in the region.

This present study was initiated as recommended by [7] and serves as a follow-up to further the scope of their findings. As a result, this present study evaluated how the various stakeholders perceive the impacts of the proposed cost management factors on the success of construction of public buildings in the Sahel region. This study is limited in scope to the Anglophone part of the western Sahel region. As such, it is delimited to Yobe, a frontline Sahel state in Nigeria, to represent the perceptions of construction stakeholders in the region.

This study contributes valuable knowledge to the existing literature in the construction sector, largely due to scarcity of information over the years, by delving on cost management success factors, which are peculiar to the built environment which are being continuously or has been devasted with issues related to insecurity and climate change crisis.

I. Research Objective: To evaluate the perceptions of stakeholders on the impacts of cost management success factors on public building construction projects in the Sahel region of Nigeria.

II. Research Hypothesis: There is no significant agreement amongst construction stakeholders' in their perceptions on the possible impacts of cost management success factors in the Sahel region of Nigeria.

2.0 LITERATURE REVIEW

2.1. Construction Project Cost Management

To ensure that the client's or project sponsor's budget is accurately set and maintained, and to achieve the best cost performance, project cost management is essential. This encompasses a variety of procurement management tasks. According to Palikila [8], effective project cost management involves setting the budget, monitoring it effectively, and providing regular reports on it. It also involves continuous cost planning for any changes in the design, creating the necessary contract documentation, and providing advice on variations and claims as the project progresses. Additionally, the cost of the resources required to fulfill project activities is a primary focus of project cost management [3]. Therefore, construction project cost management should consider the impact of project decisions on the subsequent recurring costs of using, maintaining, and supporting the product, service, or result of the project.

The management team of a project ought to be well engaged in the construction cost management tasks before and after contracts are signed. Construction cost management is the process which ensures that the contract sum is within the client's approved budget or cost limit [9]. Construction project cost management involves four processes, each with its own set of necessary inputs, tools and techniques, and outputs [3].The processes are summarized as follows:

Plan Cost Management: This is the process of creating the policies, procedures, and documents for budget planning, management, and control. This method provides direction and guidance on how the project expenses will be managed at every stage of the process.

Estimate Costs: It is the process of estimating the financial resources required to finish project activities. As the project is being carried out, cost estimates should be evaluated and updated to reflect new information as it becomes available and or assumptions as they are put to the test. Estimated costs involve the selection and evaluation of costing options for starting and finishing the project. The main advantage of this procedure is that it establishes the cost necessary to accomplish the project's work.

Determine Budget: This is the process that involves creating an allowed cost baseline by combining the anticipated costs of many tasks or work packages. Its advantage is that it establishes the cost baseline by which project performance can be tracked as well as managed.

Controlling costs: This process involves keeping track of the project's progress in order to update project costs and handle adjustments to the cost baseline. It also entails influencing the variables that lead to changes in the approved cost baseline, ensuring that all change requests are handled promptly, and preventing project costs from exceeding the approved budget, among other considerations. The key benefit of this process is that it provides the means to recognize variance from the plan in order to take corrective action and minimize risk.

2.2. Construction Project Cost Overrun

Costs are anticipated for all resources that are required and will be invoiced to complete a project [3]. These resources include, but are not limited to, labour, supplies, plants and machineries, buildings, services, and professional fees. They also contain unique types of expenses such as inflation allowance, finance costs, and contingency expenditures. Cost overrun in public building construction projects occurs when the final project cost exceeds the initially set budget in the project contract. The Scottish Parliament Building in Edinburgh is a well-known example of a public building project that ran over budget in this area of the sector's history. The project was initiated in 1999 and was expected to be completed between 1999 and 2001, with an initial contract price ranging from £10 million to £40 million [10]. However, the project was only completed in the year 2004, 3 years after the originally planned time frame, at a cost of £430 million British Pounds, or more than 100% of the original estimate.

According to Potts [9], Lord Fraser identified 20 prominent causative issues in his report, titled "The Holyrood Inquiry of 2004," which was established to investigate the subpar final cost of the Scottish Parliament building construction projects. Among them being inappropriate procurement route, lack of experience and competency of the project manager, lack of construction experience of the project sponsor, lack of adequate budget, lack of involvement of key stakeholders, inadequacy of project brief, poor communication, and ineffective monitoring system, poor cost management and non-consideration of the complexities of the project. Construction projects with cost overruns, incur the risk of defaulting, which would have a severe negative impact on all parties involved, especially the client, project sponsor, and the contractors respectively [11].

2.3. The Concept of Cost Management Success Factors

Success factors are traits, circumstances, or variables, that when correctly sustained, maintained, and controlled, can have a significant impact on a project's success [12]. An understanding of successful cost management factors is necessary to complete a public building construction project within the contractually agreed budget. This study analyzed success factors for cost management from various empirical studies conducted globally, which can be summed up as follows:

In their studies of the factors affecting cost performance in public construction projects in Afghanistan, [13] identified five latent factors: project team competence, socio-economic and political support, governance and public procurement, planning and risk management, and project characteristics. According to Obi el al. [14], the most important variables for the cost management success of public housing projects are the project team's competencies, team dynamics, collaborative working methods, early contractor involvement, and efficient construction planning and management. Sinesilassie et al. [15] identified several success factors affecting cost performance in Ethiopia. They found that scope clarity, the commitment and responsibilities of all participants and teams, and the project manager's competence positively impact the cost performance of public construction projects. According to a review of 48 cost management factors for industrial building systems by [16] in Malaysia, the five most important success factors are the contractor's construction planning and control, the manager's experience, communication among all project team members, the project manager's competence, and the quantity of materials ordered. According to Tayeh et al. [17] in their studies of the success factors for construction projects in the Gaza Strip, Palestine, the most important factors are: a clearly defined project scope, the experience of the design team and contractor, the closure of crossing points, the presence of highly qualified technical staff, the availability of funding, the payment system, the contractor's reputation, delays in obtaining funding, and adequate time for design. In their studies of the factors influencing the success of public construction projects, [18] identified the following as the most important success factors: a clear understanding of the project's scope, thorough pre-tender site investigation, regular owner monitoring and feedback, minimal interference from bureaucracy, society, or politics, well-defined scope of work, quality control and assurance activities, and adequate communication among all project participants. Table 1 shows the construction cost management success factors specific to geographic locations affected by insurgency and climate change crises, as adapted for this study.

Table 1 Proposed Construction Cost Management Success Factors in the Sahel Region

Cost management success factors
Detailed and clear contract documents
Setting realistic project scope and detailed achievable outcomes
Project manager’s previous work experience
Support from top management
Availability of finance
Effective communication and teamwork
Project planning and monitoring
Awarding contract to competent contractors
Application of latest techniques for construction project operations
Proper mechanism for ensuring transparency, accountability and auditing
Prioritization of project task/activities
Project manager’s technical competence
Availability of plants, equipment and machineries for project operations
Stakeholders’ commitment to the project goals
Taking adequate security and climate change mitigating measures
Project team technical abilities
Consistency of design documents
Deployment of appropriate procurement methods for construction project delivery
Deployment of skilled and experienced workforce
Near accuracy of cost estimate
Understanding of individual(s) responsibilities to the project
Consideration of the size, type and nature of the project
Effective maintenance of machineries, plants and equipment

Source: Adapted [7, 9]

2.4. Public Building Construction Projects

Public building construction project in the Sahel, like in Nigeria, are characterized by project initiated and funded by either the federal, state and or local government council authorities across the country. Additionally, as part of their corporate and social duties, donor groups and corporations occasionally participate in the provision of public construction projects to communities as part of their corporate social responsibilities [7]. For instance, it has been reported that thousands of public building infrastructures, such as schools, hospitals, government offices, and public and private housing units, have been abandoned or partially or completely destroyed due to high-profile insecurity related to the activities of the Islamic State of West Africa Province (ISWAP) and Jama'at Ahl as-Sunnah li-Da'awat Wal Jihadi, derogatorily known as Boko Haram, in the Sahel region. This includes areas in Borno and Yobe states in Nigeria; Diffa and Tillaberi regions in the Republic of Niger; the Far North and Northern regions in the Republic of Cameroon; and Lac, Kanem, and Hadjer-Lamis regions in the Republic of Chad [7]. The border states, regions, and provinces between the Republic of Burkina Faso, Niger, and Mali are also affected.

2.5. An Overview of the Sahel Region

Due to recurring problems, especially those related to climate change and insecurity, which have devastating effects on human lives, building infrastructures, and capital growth, the Sahel has been a focal point of public attention for decades. The Sahel is a geographic zone that serves as a transition between the Sahara Desert and the Sudanian Savanna region. Located on the African continent, the Sahel is characterized by conflicts, refugees, internally displaced persons, and climate change crises. For decades, the activities of various insurgent and terrorist organizations have had devastating consequences for its built environment.

The Sahel region comprises 17 countries which are Nigeria, Benin, Burkina Faso, Cameroon, Cape Verde, Côte d'Ivoire, Gambia, Guinea (Conakry), Djibouti, Ethiopia, Eritrea, Mali, Mauritania, Niger, Senegal, Sudan, and Chad. It stretches from the Atlantic Ocean of West Africa to the Red Sea in the North-Eastern part of Africa [4]. However, the region is only partially occupied by more than half of the Sahel countries. For instance, only the region of Nigeria that borders both the Republic of Chad and the Niger is severely affected, most particularly in Borno and Yobe State. Figure 1 depicts a visual representation of several prominent Sahelian countries.

Figure 1 Prominent Sahel region nations [19]

3.0 METHODOLOGY

In this study, a descriptive survey methodology was employed to elicit responses, with a structured questionnaire used as the data collection instrument. This methodology has been utilized in previous studies in the region, such as those by [7, 20]. A 5-point Likert scale, ranging from "1" (very low) to "5" (very high), was used to rate the impacts of the twenty-three (23) cost management success factors adapted for this study.

This study was limited in scope to the Anglophone part of the western Sahel region and was delimited to Nigeria. Yobe, a frontline Sahel state in Nigeria, was used as a case study to represent the perceptions of construction stakeholders in the region. The state is located in the extreme North-Eastern part of the Country. The state has a population of approximately 2.67 million people, with a land mass area of 46,609Km^2 [20]. The survey was specifically conducted in Damaturu, the state capital, as well as in other major towns. The study areas were chosen due to their accessibility, high concentration of construction activities, presence of construction professionals, and the relative security measures available in these major urban towns.

Critical construction professionals, including architects, engineers, quantity surveyors, builders, planners, and estate surveyors and valuers, were grouped into categories of contractors, clients, and consultants. Their views were sought as stakeholders in the study.

A convenience sample of 150 questionnaires was distributed to accessible construction professionals in the study area using a multiple snowball sampling technique. This method was similar to those used in previous studies in the area, such as [7, 20]. A total of 124 questionnaires were successfully retrieved from respondents, with 118 deemed suitable for data analysis. The research methodology flow chart adapted for this survey is depicted in Figure 2.

The Statistical Package for the Social Sciences (SPSS) version 24.0 and Microsoft Excel were used to perform both descriptive and inferential data analysis. This included tables, frequencies, percentages, mean scores, standard deviations, and relative impact indices. The ratings of the impacts of the cost management success factors were adapted from previous studies in the region, as shown in Table 2.

Table 2 Ratings of Success Factors

Grades	Impacts
0.0-1.49	Very low
1.50-2.49	Low
2.50-3.49	Moderate
3.50-4.49	High
4.50-5.00	Very high

Adopted: [7]

Similarly, the formula used to determine the 'relative severity impacts' of the cost management success was equally adapted from similar studies by [7] as presented as follows:

$$\text{Index factor (I.F)} = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5 + 6n6}{P * (N)} \quad (1)$$

Therefore,

$$\text{Relative Severity Index (RSI)} = (Index\ factor)x\ 100 \quad (2)$$

Where:

n_1 = Number of ratings with 'Very low' scale
n_2 = Number of ratings with 'low' scale
n_3 = Number of ratings with 'moderate' scale
n_4 = Number of ratings with 'high' scale

n_5 = Number of ratings with 'Very high' scale
P = The Likert scale with the highest value
N = Total of number respondents in the study.

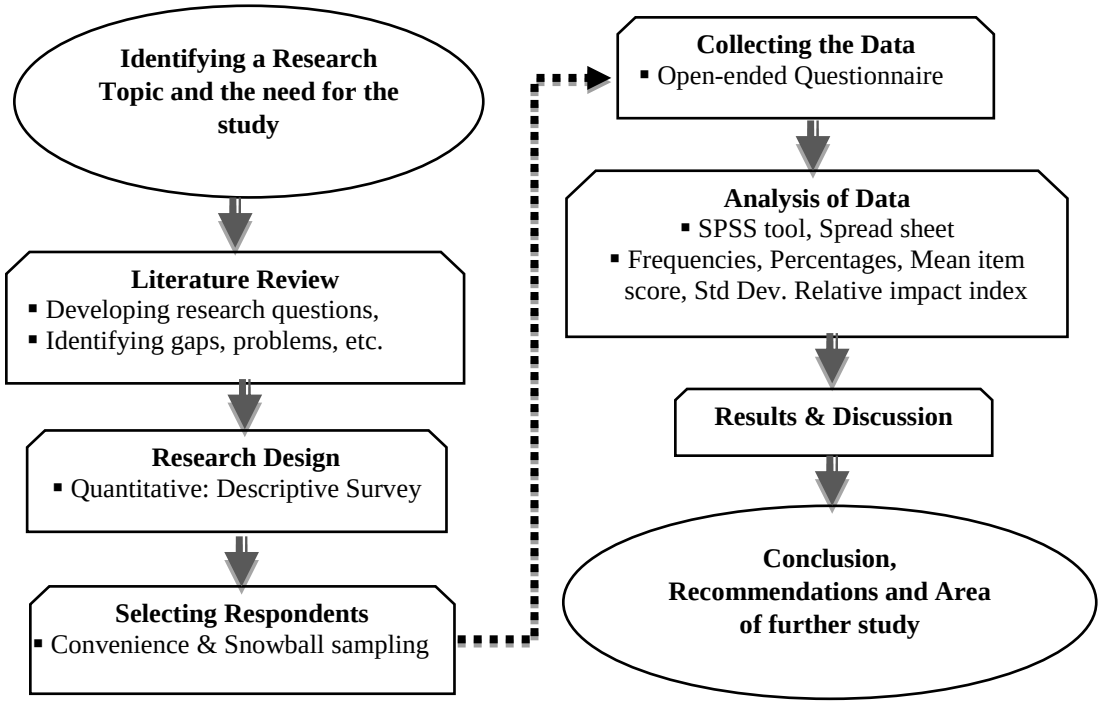

Figure 2 Descriptive survey methodological flow chart [20]

4.0 RESULTS AND DISCUSSIONS

According to the biodata of the respondents as shown in Table 3, majority of the stakeholders, 54 (45.8%), possessed a first degree or higher diploma, and 36 (30.5%) have a master's degree or post-graduate diploma, meaning that almost all of the respondents have the relevant academic credentials, suggesting that their evaluation is intellectually robust. Nearly all relevant professions participated in the survey, with engineering professionals constituting 44 (37.3%) and planning/estate surveying professionals making up 30 (25.4%). Almost all the stakeholders have the necessary years of work experience in the construction sector, with the majority having either 6-10 years (36 or 30.5%) or more than 15 years of experience. Therefore, the respondents were qualified to take the survey, which increased the reliability of the findings. Sixty professionals (50.8%) were working for the clients, 28 (23.7%) were working for the consultants, and 30 professionals (25.4%) were representing the contractors. As a result, all the important parties were effectively represented. The increased engagement of clients may be related to the fact that they are most affected by cost overruns. All of the stakeholders have encountered overrun in cost of the initial agreed contract sum, with majority of the respondents 74 (62.7%) reporting overrun ranging from of 5-25% of the initial contract sum, 22 (18.6%) reporting more than 35% in cost overrun. As a result, in Yobe a Sahelian state in the Nation of Nigeria, cost overrun continued to be a significant problem in the delivery of public building constructions projects.

Table 4 shows the reliability test results of the adapted 23 cost management success factors using internal consistency. The findings revealed that the Alpha (α) value of 0.935 obtained for this study was greater than the recommended acceptable minimum value of 0.70 [21, 22].

Table 3 Bio-data of the Respondents

Categories	Features	Frequency (No)	Percentage (%)
Highest Academic Qualifications	Certificate/ Diploma	12	10.2
	Degree/Higher National Diploma	54	45.8
	Masters/Post Graduate Diploma	36	30.5
	PhD	16	13.6
	Total	**118**	**100.0**
Area of Profession	Architecture	18	15.3
	Engineering	44	37.3
	Quantity surveying	12	10.2
	Building	14	11.9
	Planning, Estate Surveying	30	25.4
	Total	**118**	**100.0**
Years of working experience	1-5 years	22	18.6
	6-10 years	36	30.5
	11-15 years	24	20.3
	More than 16 years	36	30.5
	Total	**118**	**100.0**
Working Organization	Clients	60	50.8
	Consultants	28	23.7
	Contractors	30	25.4
	Total	**118**	**100.0**
Encountered Cost-overrun	Yes	118	100.0
Extent of Cost overrun	5-15% of contract sum	40	33.9
	16-25% of contract sum	34	28.8
	26-35% of contract sum	22	18.6
	More than 35% of contract sum	22	18.6
	Total	**118**	**100.0**

Table 4 Reliability Test of Success Factors

Factors	No. of items	Cronbach's alpha (α)	Remark
Cost Management factors	23	0.935	Accepted

Table 5 presents the results of the perceptions of the architecture professionals on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all the 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors with 'Relative Severe Impacts,' ranging from 88.89% to 73.33%, and ranked in order of importance are: project team technical abilities, consistency of design documents, project manager's previous work experience, support from top management, due availability of finance, effective communication and teamwork, detailed and clear contract documents, project planning and monitoring, awarding contract to competent contractors, and application of latest techniques for construction project operations.

Table 5 The Impacts of Cost Management Success Factors 'Architecture Professionals'

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project team technical abilities	4.44	0.705	High	0.889	88.89	1
Consistency of design documents	4.33	0.970	High	0.867	86.67	2
Project manager's previous work experience	4.11	0.758	High	0.822	82.22	3
Support from top management	4.11	0.900	High	0.822	82.22	3
Due availability of finance	4.11	0.900	High	0.822	82.22	3
Effective communication and teamwork	3.89	1.023	High	0.778	77.78	6
Detailed and clear contract documents	3.89	1.410	High	0.778	77.78	6
Project planning and monitoring	3.78	1.060	High	0.756	75.56	8
Awarding contract to competent contractors	3.78	1.263	High	0.756	75.56	8
Application of latest techniques for construction project operations	3.67	0.686	High	0.733	73.33	10
Setting realistic project scope and detailed achievable outcomes	3.67	0.686	High	0.733	73.33	10
Project manager's technical competence	3.67	0.970	High	0.733	73.33	10
Availability of plants, equipment and machineries for project operations	3.67	1.085	High	0.733	73.33	10
Taking adequate security and climate change measures	3.67	1.372	High	0.733	73.33	10
Effective maintenance of machineries, plants and equipment	3.56	1.097	High	0.711	71.11	15
Deployment of appropriate procurement methods for construction project delivery	3.56	1.294	High	0.711	71.11	15
Proper mechanism for ensuring transparency, accountability and auditing	3.44	0.511	Moderate	0.689	68.89	17
Prioritization of project task/activities	3.44	1.097	Moderate	0.689	68.89	17
Stakeholders' commitment to the project goals	3.44	1.199	Moderate	0.689	68.89	17
Near accuracy of cost estimate	3.44	1.199	Moderate	0.689	68.89	17
Understanding of individual(s) responsibilities to the project	3.33	0.970	Moderate	0.667	66.67	21
Consideration of the size, type and nature of the project	3.33	1.188	Moderate	0.667	66.67	21
Deployment of skilled and experienced workforce	3.22	1.353	Moderate	0.644	64.44	23

Table 6 presents the results of the perceptions of the building professionals on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all twenty-three factors have either 'high' or 'moderate' impacts. Further findings revealed that the success factors with 'Relative Severe Impacts,' ranging from 80.00% to 71.43%, and ranked in order of importance are: project manager's previous work experience, near accuracy of cost estimate, taking adequate security and climate change measures, deployment of skilled and experienced workforce, consistency of design documents, project manager's technical competence, prioritization of project task/activities, effective communication and teamwork, project team technical abilities, and consideration of the size, type and nature of the project, respectively.

Table 7 presents the results of the perceptions of the engineering professionals on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either 'high' or 'moderate' impacts. Further findings revealed that the success factors with 'Relative Severe Impacts,' ranging from 80.00% to 71.43%, and ranked in order of importance are: project manager's previous work experience, near accuracy of cost estimate, taking adequate security and climate change measures, deployment of skilled and experienced workforce, consistency of design documents, project manager's technical competence, project team technical abilities, prioritization of project task/activities, effective communication and teamwork, and project team technical abilities.

Table 6 The Impacts of Cost Management Success Factors 'Building Professionals'

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's previous work experience	4.00	0.784	High	0.800	80.00	1
Near accuracy of cost estimate	3.86	0.864	High	0.771	77.14	2
Taking adequate security and climate change measures	3.86	0.864	High	0.771	77.14	2
Deployment of skilled and experienced workforce	3.71	0.469	High	0.743	74.29	4
Consistency of design documents	3.71	0.726	High	0.743	74.29	4
Project manager's technical competence	3.71	0.914	High	0.743	74.29	4
Prioritization of project task/activities	3.57	0.756	High	0.714	71.43	7
Effective communication and teamwork	3.57	1.089	High	0.714	71.43	7
Project team technical abilities	3.57	1.223	High	0.714	71.43	7
Consideration of the size, type and nature of the project	3.57	1.223	High	0.714	71.43	7
Awarding contract to competent contractors	3.43	1.223	Moderate	0.686	68.57	11
Deployment of appropriate procurement methods for construction project delivery	3.29	0.726	Moderate	0.657	65.71	12
Understanding of individual(s) responsibilities to the project	3.29	0.914	Moderate	0.657	65.71	12
Proper mechanism for ensuring transparency, accountability and auditing	3.29	1.204	Moderate	0.657	65.71	12
Due availability of finance	3.29	1.437	Moderate	0.657	65.71	12
Application of latest techniques for construction project operations	3.29	1.437	Moderate	0.657	65.71	12
Detailed and clear contract documents	3.14	0.663	Moderate	0.629	62.86	17
Support from top management	3.14	1.292	Moderate	0.629	62.86	17
Setting realistic project scope and detailed achievable outcomes	3.00	0.961	Moderate	0.600	60.00	19
Stakeholders' commitment to the project goals	3.00	1.359	Moderate	0.600	60.00	19
Availability of plants, equipment and machineries for project operations	3.00	1.569	Moderate	0.600	60.00	19
Effective maintenance of machineries, plants and equipment	2.86	1.292	Moderate	0.571	57.14	22
Project planning and monitoring	2.86	1.027	Moderate	0.571	57.14	23

Table 8 present the results of the perceptions of the quantity surveying professionals on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors with 'Relative Severe Impacts,' ranging from 76.67% to 66.67%, and ranked in order of importance are: project manager's technical competence, project planning and monitoring, project team technical abilities, near accuracy of cost estimate, setting realistic project scope and detailed achievable outcomes, consideration of the size, type and nature of the project, deployment of skilled and experienced workforce, stakeholders' commitment to the project goals, support from top management, and stakeholders' commitment to the project goals, respectively.

Table 7 The Impacts of Cost Management Success Factors 'Engineering Professionals'

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's previous work experience	4.00	0.784	High	0.800	80.00	1
Near accuracy of cost estimate	3.86	0.864	High	0.771	77.14	2
Taking adequate security and climate change measures	3.86	0.864	High	0.771	77.14	2
Deployment of skilled and experienced workforce	3.71	0.469	High	0.743	74.29	4
Consistency of design documents	3.71	0.726	High	0.743	74.29	4
Project manager's technical competence	3.71	0.914	High	0.743	74.29	4
Prioritization of project task/activities	3.57	0.756	High	0.714	71.43	7
Effective communication and teamwork	3.57	1.089	High	0.714	71.43	7
Project team technical abilities	3.57	1.223	High	0.714	71.43	7
Consideration of the size, type and nature of the project	3.57	1.223	High	0.714	71.43	7
Awarding contract to competent contractors	3.43	1.223	Moderate	0.686	68.57	11
Deployment of appropriate procurement methods for construction project delivery	3.29	0.726	Moderate	0.657	65.71	12
Understanding of individual(s) responsibilities to the project	3.29	0.914	Moderate	0.657	65.71	12
Proper mechanism for ensuring transparency, accountability and auditing	3.29	1.204	Moderate	0.657	65.71	12
Application of latest techniques for construction project operations	3.29	1.437	Moderate	0.657	65.71	12
Due availability of finance	3.29	1.437	Moderate	0.657	65.71	12
Detailed and clear contract documents	3.14	0.663	Moderate	0.629	62.86	17
Support from top management	3.14	1.292	Moderate	0.629	62.86	17
Setting realistic project scope and detailed achievable outcomes	3.00	0.961	Moderate	0.600	60.00	19
Stakeholders' commitment to the project goals	3.00	1.359	Moderate	0.600	60.00	19
Availability of plants, equipment and machineries for project operations	3.00	1.569	Moderate	0.600	60.00	19
Effective maintenance of machineries, plants and equipment	2.86	1.292	Moderate	0.571	57.14	22
Project planning and monitoring	2.86	1.027	Moderate	0.571	57.14	23

Table 9 presents the results of the perceptions of the planning/ estate surveying professionals on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all the 23 factors have 'moderate' impacts. Further findings revealed that the success factors with 'Relative Severe Impacts,' ranging from 69.33% to 65.33%, and ranked in order of importance are: project manager's previous work experience, project team technical abilities, detailed and clear contract documents, near accuracy of cost estimate, project planning and monitoring, effective maintenance of machineries, plants and equipment, project manager's technical competence, availability of plants, equipment and machineries for project operations, setting realistic project scope and detailed achievable outcomes, and taking adequate security and climate change measures.

Table 8 The Impacts of Cost Management Success Factors 'Quantity Surveying Professionals'

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's technical competence	3.83	0.937	High	0.767	76.67	1
Project planning and monitoring	3.67	0.492	High	0.733	73.33	2
Project team technical abilities	3.67	0.985	High	0.733	73.33	2
Near accuracy of cost estimate	3.67	0.985	High	0.733	73.33	2
Setting realistic project scope and detailed achievable outcomes	3.50	0.522	High	0.700	70.00	5
Consideration of the size, type and nature of the project	3.50	0.798	High	0.700	70.00	5
Deployment of skilled and experienced workforce	3.50	1.168	High	0.700	70.00	5
Support from top management	3.33	0.985	Moderate	0.667	66.67	8
Stakeholders' commitment to the project goals	3.33	1.155	Moderate	0.667	66.67	8
Taking adequate security and climate change measures	3.33	1.303	Moderate	0.667	66.67	8
Project manager's previous work experience	3.33	1.435	Moderate	0.667	66.67	8
Detailed and clear contract documents	3.17	1.115	Moderate	0.633	63.33	12
Awarding contract to competent contractors	3.17	1.267	Moderate	0.633	63.33	12
Effective communication and teamwork	3.17	1.403	Moderate	0.633	63.33	12
Availability of plants, equipment and machineries for project operations	3.00	1.044	Moderate	0.600	60.00	15
Understanding of individual(s) responsibilities to the project	3.00	1.206	Moderate	0.600	60.00	15
Effective maintenance of machineries, plants and equipment	3.00	1.477	Moderate	0.600	60.00	15
Prioritization of project task/activities	3.00	1.595	Moderate	0.600	60.00	15
Application of latest techniques for construction project operations	3.00	0.603	Moderate	0.600	60.00	19
Consistency of design documents	2.83	0.937	Moderate	0.567	56.67	20
Deployment of appropriate procurement methods for construction project delivery	2.83	1.115	Moderate	0.567	56.67	20
Proper mechanism for ensuring transparency, accountability and auditing	2.67	1.435	Moderate	0.533	53.33	22
Due availability of finance	2.33	0.779	Moderate	0.467	46.67	23

Table 10 presents the results of the perceptions of the clients on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors which have 'Relative Severe Impacts' ranging from (74.00 - 70.00)% and ranked in the order of importance are: project planning and monitoring, support from top management, project team technical abilities, project manager's previous work experience, setting realistic project scope and detailed achievable outcomes, near accuracy of cost estimate, project manager's technical competence, consistency of design documents, detailed and clear contract documents, and availability of plants, equipment and machineries for project operations.

Table 9 The Impacts of Cost Management Success Factors 'Planning/Estate Surveying Professionals'

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's previous work experience	3.47	0.973	Moderate	0.693	69.33	1
Project team technical abilities	3.47	1.106	Moderate	0.693	69.33	1
Detailed and clear contract documents	3.33	0.711	Moderate	0.667	66.67	3
Near accuracy of cost estimate	3.33	0.959	Moderate	0.667	66.67	3
Project planning and monitoring	3.33	1.028	Moderate	0.667	66.67	3
Effective maintenance of machineries, plants and equipment	3.33	1.093	Moderate	0.667	66.67	3
Project manager's technical competence	3.33	1.093	Moderate	0.667	66.67	3
Availability of plants, equipment and machineries for project operations	3.27	0.944	Moderate	0.653	65.33	8
Setting realistic project scope and detailed achievable outcomes	3.27	1.081	Moderate	0.653	65.33	8
Taking adequate security and climate change measures	3.27	1.311	Moderate	0.653	65.33	8
Support from top management	3.20	0.997	Moderate	0.640	64.00	11
Prioritization of project task/activities	3.13	1.106	Moderate	0.627	62.67	12
Deployment of skilled and experienced workforce	3.07	0.868	Moderate	0.613	61.33	13
Stakeholders' commitment to the project goals	3.07	1.081	Moderate	0.613	61.33	13
Due availability of finance	3.00	0.910	Moderate	0.600	60.00	15
Deployment of appropriate procurement methods for construction project delivery	3.00	0.910	Moderate	0.600	60.00	15
Application of latest techniques for construction project operations	3.00	1.287	Moderate	0.600	60.00	15
Effective communication and teamwork	2.93	1.311	Moderate	0.587	58.67	18
Consideration of the size, type and nature of the project	2.87	0.900	Moderate	0.573	57.33	19
Proper mechanism for ensuring transparency, accountability and auditing	2.87	1.042	Moderate	0.573	57.33	19
Consistency of design documents	2.87	1.106	Moderate	0.573	57.33	19
Understanding of individual(s) responsibilities to the project	2.87	1.167	Moderate	0.573	57.33	19
Awarding contract to competent contractors	2.53	1.042	Moderate	0.507	50.67	23

Table 11 presents the results of the perceptions of the 'Consultants' on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors which have 'Relative Severe Impacts' ranging from (78.57 - 72.86)% and ranked in the order of importance are: project manager's previous work experience, taking adequate security and climate change measures, detailed and clear contract documents, due availability of finance, stakeholders' commitment to the project goals, availability of plants, equipment and machineries for project operations, effective maintenance of machineries, plants and equipment, consistency of design documents, effective maintenance of machineries, plants and equipment; deployment of appropriate procurement methods for construction project delivery and effective communication and teamwork.

Table 10 The Impacts of Cost Management Success Factors 'The Client's' Perceptions

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project planning and monitoring	3.70	1.046	High	0.740	74.00	1
Support from top management	3.70	1.139	High	0.740	74.00	1
Project team technical abilities	3.67	0.986	High	0.733	73.33	3
Project manager's previous work experience	3.67	1.020	High	0.733	73.33	3
Setting realistic project scope and detailed achievable outcomes	3.57	0.963	High	0.713	71.33	5
Near accuracy of cost estimate	3.57	0.963	High	0.713	71.33	5
Project manager's technical competence	3.53	0.965	High	0.707	70.67	7
Consistency of design documents	3.53	1.096	High	0.707	70.67	7
Detailed and clear contract documents	3.50	1.066	High	0.700	70.00	9
Availability of plants, equipment and machineries for project operations	3.50	1.186	High	0.700	70.00	9
Consideration of the size, type and nature of the project	3.47	1.127	Moderate	0.693	69.33	11
Due availability of finance	3.47	1.268	Moderate	0.693	69.33	11
Taking adequate security and climate change measures	3.43	1.240	Moderate	0.687	68.67	13
Deployment of skilled and experienced workforce	3.40	1.153	Moderate	0.680	68.00	14
Effective maintenance of machineries, plants and equipment	3.37	1.089	Moderate	0.673	67.33	15
Deployment of appropriate procurement methods for construction project delivery	3.27	1.039	Moderate	0.653	65.33	16
Prioritization of project task/activities	3.23	1.155	Moderate	0.647	64.67	17
Stakeholders' commitment to the project goals	3.23	1.240	Moderate	0.647	64.67	17
Application of latest techniques for construction project operations	3.23	1.267	Moderate	0.647	64.67	17
Proper mechanism for ensuring transparency, accountability and auditing	3.17	1.251	Moderate	0.633	63.33	20
Effective communication and teamwork	3.13	1.295	Moderate	0.627	62.67	21
Understanding of individual(s) responsibilities to the project	3.07	1.103	Moderate	0.613	61.33	22
Awarding contract to competent contractors	2.90	1.231	Moderate	0.580	58.00	23

Table 12 presents the results of the perceptions of the contractors on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors which have 'Relative Severe Impacts' ranging from (80.00 - 64.00)% and ranked in the order of importance are: project manager's technical competence, project team technical abilities, effective communication and teamwork, taking adequate security and climate change measures , project manager's previous work experience, project planning and monitoring, consistency of design documents, due availability of finance, awarding contract to competent contractors, and availability of plants, equipment and machineries for project operations.

Table 13 presents the results of the overall perceptions of the stakeholders on the impacts of cost management success factors on public building construction projects in the Sahel region. The results show that all 23 factors have either a 'high or moderate' impacts. Further findings revealed that the success factors which have 'Relative Severe Impacts' ranging from (74.24 - 73.33)% and ranked in the order of importance are: project manager's previous work experience, project team technical abilities, project manager's technical competence, taking adequate security and climate change measures, project planning and monitoring, consistency of design documents, support from top management, due availability of finance, detailed and clear contract documents, and availability of plants, equipment and machineries for project operations.

Table 11 The Impacts of Cost Management Success Factors 'The Consultant's' Perceptions

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's previous work experience	3.93	0.716	High	0.786	78.57	1
Taking adequate security and climate change measures	3.86	1.008	High	0.771	77.14	2
Detailed and clear contract documents	3.79	0.876	High	0.757	75.71	3
Due availability of finance	3.79	0.876	High	0.757	75.71	3
Stakeholders' commitment to the project goals	3.79	0.957	High	0.757	75.71	3
Availability of plants, equipment and machineries for project operations	3.71	0.810	High	0.743	74.29	6
Consistency of design documents	3.71	0.897	High	0.743	74.29	6
Effective maintenance of machineries, plants and equipment	3.71	1.049	High	0.743	74.29	6
Deployment of appropriate procurement methods for construction project delivery	3.64	0.826	High	0.729	72.86	9
Effective communication and teamwork	3.64	1.129	High	0.729	72.86	9
Project team technical abilities	3.57	0.997	High	0.714	71.43	11
Near accuracy of cost estimate	3.50	0.839	High	0.700	70.00	12
Awarding contract to competent contractors	3.50	1.139	High	0.700	70.00	12
Prioritization of project task/activities	3.43	0.920	Moderate	0.686	68.57	14
Support from top management	3.43	0.997	Moderate	0.686	68.57	14
Project planning and monitoring	3.36	0.826	Moderate	0.671	67.14	16
Project manager's technical competence	3.36	0.911	Moderate	0.671	67.14	16
Consideration of the size, type and nature of the project	3.36	0.911	Moderate	0.671	67.14	16
Understanding of individual(s) responsibilities to the project	3.29	0.897	Moderate	0.657	65.71	19
Application of latest techniques for construction project operations	3.29	1.049	Moderate	0.657	65.71	19
Deployment of skilled and experienced workforce	3.29	1.117	Moderate	0.657	65.71	19
Setting realistic project scope and detailed achievable outcomes	3.21	0.876	Moderate	0.643	64.29	22
Proper mechanism for ensuring transparency, accountability and auditing	3.07	0.813	Moderate	0.614	61.43	23

Table 14 presents the results of the study's hypothesis, which states that there was no significant level of agreement among stakeholders in their ratings of the cost management success factors. Kendall's Coefficient of Concordance, a nonparametric statistical metric, was used to assess the hypothesis. The findings revealed that all stakeholders were in concordance in their ratings, with an overall agreement at a significance level of 0.000 (which is less than 0.05). Consequently, the hypothesis was rejected.

A major finding of this study was that the majority of stakeholders (62.7%) reported experiencing cost overruns ranging from 5% to 25% of the initial contract sum, while 18.6% reported cost overruns exceeding 35%. Therefore, cost overruns remain a significant problem in public building construction projects in the Sahel region of Nigeria and require immediate attention.

The importance of the success factors 'Project manager's previous work experience,' 'Project team technical abilities,' and 'Project manager's technical competence,' with overall severe impacts of 74.24%, 73.56%, and 72.20%, and ranked first, second, and third respectively by stakeholders, underscores their essential role in successful public building construction projects. In a volatile region like the Sahel, previous experience and construction management skills are crucial for effective project delivery. These findings are consistent with previous studies such as [13, 15] and [23].

Table 12 The Impacts of Cost Management Success Factors 'The Contractor's' Perceptions

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's technical competence	4.00	0.830	High	0.800	80.00	1
Project team technical abilities	3.80	1.186	High	0.760	76.00	2
Effective communication and teamwork	3.67	1.093	High	0.733	73.33	3
Taking adequate security and climate change measures	3.67	1.155	High	0.733	73.33	3
Project manager's previous work experience	3.60	1.102	High	0.720	72.00	5
Project planning and monitoring	3.40	0.968	Moderate	0.680	68.00	6
Consistency of design documents	3.40	1.380	Moderate	0.680	68.00	6
Due availability of finance	3.33	1.093	Moderate	0.667	66.67	8
Awarding contract to competent contractors	3.27	1.461	Moderate	0.653	65.33	9
Support from top management	3.20	0.925	Moderate	0.640	64.00	10
Detailed and clear contract documents	3.20	1.126	Moderate	0.640	64.00	10
Application of latest techniques for construction project operations	3.20	1.126	Moderate	0.640	64.00	10
Availability of plants, equipment and machineries for project operations	3.20	1.186	Moderate	0.640	64.00	10
Proper mechanism for ensuring transparency, accountability and auditing	3.13	0.629	Moderate	0.627	62.67	14
Prioritization of project task/activities	3.13	0.819	Moderate	0.627	62.67	14
Setting realistic project scope and detailed achievable outcomes	3.13	0.900	Moderate	0.627	62.67	14
Near accuracy of cost estimate	3.13	1.224	Moderate	0.627	62.67	14
Understanding of individual(s) responsibilities to the project	3.07	1.081	Moderate	0.613	61.33	18
Deployment of skilled and experienced workforce	3.07	1.081	Moderate	0.613	61.33	18
Deployment of appropriate procurement methods for construction project delivery	3.00	1.050	Moderate	0.600	60.00	20
Effective maintenance of machineries, plants and equipment	3.00	1.232	Moderate	0.600	60.00	20
Stakeholders' commitment to the project goals	2.93	1.258	Moderate	0.587	58.67	22
Consideration of the size, type and nature of the project	2.87	1.167	Moderate	0.573	57.33	23

The fourth-ranked success factor, 'Taking adequate security and climate change measures,' has an overall relative impact of 71.86% on public building construction projects, as indicated by the stakeholders. In this region, insecurity, particularly due to the activities of insurgent and terrorist organizations like Boko Haram and ISWAP, has been a major issue for decades. A well-secured construction site significantly contributes to high productivity, prevents unscheduled site closures, ensures workers' peace of mind, allows for the possibility of working overtime, reduces time overruns, and ensures high-quality finished construction projects, among other benefits. This finding aligns with the conclusions of [17] in their studies in Palestine.

The fifth-ranked success factor, 'Project planning and monitoring,' with a relative impact of 70.85% on public building construction projects, is a crucial tool for effective project delivery. The importance of this success factor is consistent with previous findings by scholars such as [18, 23, 24].

Other cost management success factors with notable 'relative impacts' on public building construction projects in the Sahel regions are: Consistency of design documents; Support from top management; Due availability of finance; Detailed and clear contract documents; Availability of plants, equipment and machineries for project operations; Near accuracy of cost estimate, and Effective communication and teamwork respectively.

Table 13 The Overall Impacts of Cost Management Success Factors 'Stakeholder's' Perceptions

Success factors	Mean	Std. Dev.	Impacts	Index factor	RSI	Rank
Project manager's previous work experience	3.71	0.979	High	0.742	74.24	1
Project team technical abilities	3.68	1.037	High	0.736	73.56	2
Project manager's technical competence	3.61	0.943	High	0.722	72.20	3
Taking adequate security and climate change measures	3.59	1.171	High	0.719	71.86	4
Project planning and monitoring	3.54	0.984	High	0.708	70.85	5
Consistency of design documents	3.54	1.130	High	0.708	70.85	5
Support from top management	3.51	1.068	High	0.702	70.17	7
Due availability of finance	3.51	1.145	High	0.702	70.17	8
Detailed and clear contract documents	3.49	1.052	Moderate	0.698	69.83	9
Availability of plants, equipment and machineries for project operations	3.47	1.115	Moderate	0.695	69.49	10
Near accuracy of cost estimate	3.44	1.017	Moderate	0.688	68.81	11
Effective communication and teamwork	3.39	1.227	Moderate	0.678	67.80	12
Setting realistic project scope and detailed achievable outcomes	3.37	0.941	Moderate	0.675	67.46	13
Effective maintenance of machineries, plants and equipment	3.36	1.136	Moderate	0.671	67.12	14
Deployment of appropriate procurement methods for construction project delivery	3.29	1.014	Moderate	0.658	65.76	15
Consideration of the size, type and nature of the project	3.29	1.110	Moderate	0.658	65.76	15
Deployment of skilled and competent workers	3.29	1.125	Moderate	0.658	65.76	15
Stakeholders' commitment to the project goals	3.29	1.213	Moderate	0.658	65.76	15
Prioritization of project task/activities	3.25	1.023	Moderate	0.651	65.08	19
Application of latest techniques and innovations for project operation	3.24	1.174	Moderate	0.647	64.75	20
Proper mechanism for ensuring transparency, accountability and auditing	3.14	1.020	Moderate	0.627	62.71	21
Awarding contract to competent contractors	3.14	1.287	Moderate	0.627	62.71	21
Understanding of individual(s) responsibilities to the project	3.12	1.047	Moderate	0.624	62.37	23

Table 14 Stakeholders' Level of Agreement in rating the Cost Management Success Factors

Stakeholders'	Kendall's Coefficient	Chi-Square	Sig.	Remark
The Architecture	0.149	58.856	0.000	Rejected
The Building	0.133	40.929	0.008	Rejected
The Engineering	0.064	61.899	0.000	Rejected
The Quantity surveying	0.166	43.860	0.004	Rejected
The Planning/Estate surveying	0.076	49.994	0.001	Rejected
The Consultants	0.095	58.734	0.000	Rejected
The Clients/End user's	0.058	76.945	0.000	Rejected
The Contractors	0.101	66.417	0.000	Rejected
Overall	**0.037**	**96.798**	**0.000**	**Rejected**

The level of agreement among stakeholders regarding their perceptions of the impacts of cost management success factors on public building construction projects was highly significant. This finding is consistent with similar studies, such as [20] and [23].

5.0 CONCLUSION

This study evaluates the impacts of cost management success factors on public building construction projects in the Sahel region. Cost overruns in public building construction projects remain a significant issue in the region, particularly in Nigeria, a Sahelian nation. The research objectives and hypotheses set out in this study were achieved. The survey indicates that, out of the 23 proposed cost management success factors, the most important factors with notable 'Relative Severe Impacts' on public building construction projects are: project manager's previous work experience; project team's technical abilities; project manager's technical competence; taking adequate security and climate change measures; project planning and monitoring; consistency of design documents; support from top management; due availability of finance; detailed and clear contract documents; and availability of plants, equipment and machineries for project operations.

The major limitation of this study, which may affect the generalizability of its findings, is its scope. The survey is limited to the Anglophone-speaking part of the West African Sahel region, with Nigeria's Yobe State, a frontline Sahelian state, as the case study.

It is recommended that all concerned stakeholders work together to minimize the adverse impacts of climate change on both people and the environment. Climate change is a major driver of high-profile insecurity in the Sahel region, and addressing it will help create a more conducive environment for construction and development projects, thereby reducing the likelihood of cost overruns. Additionally, top management support should be prioritized, and highly skilled, competent, and experienced project managers or project management teams should be engaged to oversee public building construction projects in the region.

This study has highlighted relevant cost management success factors that are specific to and applicable within the built environment, particularly in areas impacted by high-profile insecurity and climate change crises. The findings of this study will assist construction practitioners and other stakeholders in making cost-effective decisions regarding project delivery in the region. To expand the scope and compare these findings, similar surveys should be conducted in other parts of the Sahel region, especially in Francophone-speaking areas. Additionally, replicating the study using a qualitative research methodology could provide further insights.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

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