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RESEARCH ARTICLE

The Impacts of Quality Management Success Factors on the Quality Performance of Construction Projects in the Lake Chad Basin

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ABSTRACT - In the Lake Chad Basin, the drivers of poor-quality performance of construction projects are multi-dimensional, which are compounded with issues related to insecurity and climate change. In the North-Eastern region of Nigeria, an estimated US$ 3.3 Billion was the cost of damages to housing and other public building infrastructures, with an estimated US$ 1.2 Billion needed for reconstruction and repairs to the damaged infrastructures due to activities of various terrorist organizations. Therefore, there is need to deliver projects of high standards as well as to device means to continuously assess their performance throughout the project life-cycle. Hence, this survey examined: the relative impacts of quality management success factors, and determined their effects on the quality performances of construction projects in the region. The study is limited in scope to the Anglophone speaking part of the region. A total of 80 questionnaires were distributed using both a convenience and snowball sampling techniques to the available respondents, ably represented by construction professionals with vast knowledge and years of working experience in the Nigeria's state of Yobe, being a frontline state in the Lake Chad Basin, and 59 of the questionnaires were successfully retrieved, and analysis was done with the aid of SPSS, a social science analysis software. Findings indicates that, the quality management success factors with the highest relative severity index on the quality performance are: project manager's previous work experience and supervision skills; project manager's technical competence and good leadership skills; taking appropriate security measures on project site; project planning, monitoring and evaluation; project team technical capabilities; completeness and consistency of design document; and clear and well detailed contract documents. The quality management success factors will have an overall 59.7% significant cause-effects influence on the quality performances of construction projects in the region. Further findings revealed that, the most significantly impacted quality performance measures, are: minimal or absence of rework; time taking in rectifying defective components and services; satisfaction by end users', customers and stakeholders; absence of observable defects after project completion; cost of rectifying defective components and services. This study has added to the existing body of knowledge, and has succeeded in bringing to light quality management success factors that are peculiar and applicable to areas devasted with challenges of insecurity and climate change.

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1.0 INTRODUCTION

The construction sector is essential for the growth and sustainable development of any nation [1]. The Sahel area of Africa is home to the Lake Chad Basin (LCB). However, according to [2] the Lake Chad Basin nations have been dealing with a variety of insecurity issues for decades, including terrorism, banditry, kidnappings, armed robberies, ethno-religious violence, farmers and herders violence, and other difficulties, in addition to the region's well-known problems with desertification and the lake's declining water level. Violent extremism affects the functioning, capacity, and willingness of States to provide their populations with human security, resources, and infrastructural development [2]. This is true of all the Lake Chad Basin countries. For instance, in Nigeria, the cost of damages to housing and public building infrastructures in Adamawa, Borno, and Yobe, the three frontline states in the Lake Chad Basin of the country, was estimated at US$ 3.3 Billion, with an additional US$ 1.2 Billion needed for restoration, reconstruction, and repairs to damaged infrastructures [3].

Major stakeholders including, the clients, consultants, and the contractors all have different perspectives on the topic of quality, how it should be managed, and what success factors relevant. According to a study in the United Kingdom by the Chartered Institute of Building, there is an underlying contributing cultural problem in which quality is sometimes compromised in the building sector in order to meet cost or timeline objectives [4]. According to Vasista [5], quality is the sum of a product, process, service, or system's features and inherent or assigned characteristics that have an impact

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on its capacity to demonstrate that it lives up to expectations or satisfies stated demands, requirements, and or specifications. Despite the fact that numerous definitions of quality have continued to pulp up or surfaced based on the varying opinions of researchers. However, "conformance, requirement, specifications, fitness, ease of use, low maintenance cost, and satisfaction" are the most recurring terms found in most definitions of quality. In order to meet the expectations of stakeholders, [6] states that project quality management entails processes for incorporating the organization's quality policies about planning, managing, controlling the project and the product quality requirements.

In the Lake Chad Basin, variety of factors were alleged to be contributing to the poor-quality performances of constructed projects, which includes: unethical corrupt practices, insecurity leading to unscheduled closures of site and or long-term abandonment of site due to uncertainties, inadequate monitoring and evaluation system mechanisms due to security uncertainties, subpar workmanship, climatic and environmental-related problems. Poor supply chain and procurement management are some of the other aggravating causes of poorly completed projects. Also, within a short period of projects completion, observable poor-quality related issues were reportedly manifesting at the early life-cycle of the project, some contractors in the Lake Chad Basin were reportedly using the insecurity and climate change-related issues that have been plaguing the region for decades as an excuse to deliver construction projects at exorbitant cost, but yet poor quality standard has been manifesting unabated. [7] examined crucial factors limiting the quality of public construction projects in the Nigerian state of Borno, as part of previous studies reviewed in the Lake Chad Basin region and discovered that, majority of the completed projects required numerous reworks and corrections, they concluded by stating that, poor construction management processes were to be blamed for the decline in the quality of public construction projects in the region.

Therefore, as part of the post-insurgency period due to declining state of insecurity in the region, as well as various programmes all geared towards returning the internally displaced persons and refugees back to their various pre-insurgency communities in the region, coupled with enormous resources currently being expended for the purpose of reconstruction, restoration and repairs to damaged infrastructures in the region, as such, it is pertinent to device means which will ensure that high standard and sustainable projects are delivered in the region. Hence, this survey examined: the relative impacts of quality management success factors, and their effects on the quality performances of construction projects in the Anglophone speaking part of the Lake Chad Basin. The Yobe state of Nigeria will serve as the study's geographic scope. As part of the post-insurgency effort in the area, the state is currently experiencing significant restoration, reconstruction and repairs to its damaged infrastructures by government, development commissions, corporate and international organizations.

2.0 THE CONCEPT OF QUALITY MANAGEMENT

In order to meet the expectations of stakeholders, [6] defines project quality management as all the processes for implementing the organization's quality policy by addressing the planning, managing, controlling of project and product quality needs. Also, the three fundamental processes are:

Planning quality; this is the process of determining the project's and its deliverables', quality criteria and or standards and laying out how the project will prove compliance with those requirements and or standards. This procedure's primary advantage is that it offers instructions and direction on how quality will be handled and checked throughout the project.

Control quality; this is the process of observing and documenting the outcomes of carrying out quality management operations in order to evaluate performance and guarantee that the project outputs are comprehensive, accurate, and up to the standards set by the client. The control quality process examines if the project's outputs accomplish their goals and adhere to all relevant rules, standards, regulations, and specifications. Throughout the project, the control quality procedures are used.

Manage quality; this is basically the procedure for converting the quality management plan into actionable quality activities which involves the project's adherence to the organization's quality regulations. The likelihood of achieving the quality objectives is increased, and this method also helps to uncover inefficient procedures and the root reasons of subpar quality.

2.1 Principles of quality management

For the improvement of performance in various areas for national development and sustainable growth, principles are basically formed and tested theories, standards, and requirements to drive growth and development. According to [4], there are seven quality management concepts in the construction industry, which include: leadership and fostering a culture of quality management; process approach to managing quality; ensuring that the supply chain is fully informed of the quality standards expected and are delivered; mutually beneficial supplier relationships are achieved; systematic approach to management; collaborative approach to decision-making; and customer focus.

3.0 QUALITY MANAGEMENT SUCCESS FACTORS

Good design, realistic project programming, conducive climate, and teamwork are the main factors that drove effective construction quality project delivery, according to [4]. Information that is current and pertinent, site management and

production, clients, governance, corporate behaviour, realistic budgeting, and materials are among the other topics covered. Table 1 depicts list of quality management success factors reviewed acrossed literature for this present study.

Table 1. Quality management success factors acrossed the globe

Authors	Place of study	Quality management factors
[8]	Hong Kong, China	Effective communication techniques, and training of all personnel Management commitment and good leadership direction Efficient teamwork and effective cooperation Consistent drawings and specifications Designers and contractors chosen based on merit, and Quality control inspections on the construction site
[9]	Egypt	Accuracy of estimating and tendering Proper classification of contractors, consultants, and construction projects Design and planning during the pre-construction phase Quality control and assurance system Encouraging ISO 9000 accreditation Maintenance systems during and after construction Utilization of resources, and improved innovation Increased specialization in construction work Raising the financial level and standard of living of employees
[10]	Gaza, Palestine	Site layout characteristics Site staff qualifications and expertise Design document characteristics Use of tools and materials Labour management systems Owner decision-making speed Kind of awarding method, and political climate
[11]	India	Competency of the project manager Support from upper management Monitoring and feedback from project participants Interaction between project participants, and Competency of the owners
[12]	Brunei,	Proficiency Readiness Dedication, and Efficiency, especially among managers and decision-makers
[13]	Jordan,	Top management commitment, and Customer satisfaction Construction-specific factors Supplier management Use of technology and quality management systems Leadership and culture Process and resource management Strategic planning, and continuous improvement
[4]	UK	Compliance with regulations, standards, and codes Registration and certification requirements Utilizing the right tools, the information, and appropriate materials Realistic programming and budgeting
[14]	Nigeria	Previous relationship with the client Client's involvement in design process Client's financial position Ability to choose the right design team and new methods for service leverage

However, after extensive review from previous studies on success factors, and for the purpose of this present study, twenty-three (23) quality management success factors were compiled. The factors were considered due to their peculiarities to the study region, as well as their relevance to the independent variables of this study. As such, Table 2 shows the list of quality management success factors used for the purpose of this study.

Table 2. List of quality management success factors [compiled by author's]

Quality management factors	
1.	Deployment of skilled workers
2.	Application of latest techniques and innovations for project operation
3.	Conformance to codes, standards and regulations
4.	Deployment of plants, equipment and machineries for project operations
5.	Maintenance of plants, equipment and machineries
6.	Commitment by all stakeholders to the project objectives
7.	Well defined individual responsibilities
8.	Setting realistic project scope
9.	Project manager's technical competence and good leadership skills
10.	Project manager's previous work experience and supervision skills
11.	Project team technical capabilities
12.	Top management support
13.	Consideration of the size, type and nature of the project
14.	Project planning, monitoring and evaluation
15.	Awarding contract to competent contractors and suppliers
16.	Using appropriate construction procurement methods for project delivery
17.	Completeness and consistency of design document
18.	Clear and well detailed contract documents
19.	Availability of materials and financial resources
20.	Proper mechanism for ensuring transparency and accountability
21.	Effective prioritization of project activities
22.	Effective communication
23.	Taking appropriate security measures on project site

4.0 CONSTRUCTION PROJECT QUALITY PERFORMANCE

Construction quality is based on the subjective perceptions of stakeholders per se, including the client, consultants, and the contractors in general. Over the years, researchers and experts in the construction industry have all agreed that project quality, budgeted cost estimate, as well as the completion deadline are the basic performance measures that are most frequently considered. Quality, though mostly ignored during the project initiation period, however quality is the best standard measure to be deployed when evaluating the success of construction project over the course of its life-cycle, particularly after the project completion. The quality performance measures represent the dependents variables in this survey. Table 3 shows some list of quality performance measures reviewed acrossed literatures.

Table 3. Quality performance measures across literature [4, 15]

Quality measures	
1.	Repeat business by awarding contractors with similar projects
2.	Satisfaction of stakeholders with completed projects
3.	Number of complaints or recommendations recorded on completed project
4.	Ease of maintaining completed projects
5.	Time taking in rectifying defective components and doing rework
6.	Minimal or absence of rework
7.	Cost of rectifying defective components and services
8.	Absence of observable defects after project completion
9.	Cost of reworking faulty components during construction work
10.	Little or no reports of claims, litigations and disputes after project completion

5.0 CONSTRUCTION PROJECTS IN THE LAKE CHAD BASIN

Basically, the Republic Chad, Cameroon, Niger, Nigeria, Central African Republic, and Libya are the six nations that make up the Lake Chad Basin Development Commission. As it can be seen in Figure 1, there were only four nations that directly surrounded the Lake in their borders. States in the Lake Chad Basin region have been dealing with two major problems: insecurity and the expansion of the desert leading to the receding level of the Lake's water volume; these

problems have had negative effects on human, social, economic, and infrastructural development. The region was reported to have infrastructure deficits due to years of destruction and or damage to existing ones, neglect, and long-term abandonment of major construction activities. Though, the current rate of insecurity, particularly terrorism, in the region is at its lowest stage compared to 2014-2019 period. As such, recently, the region has been witnessing an unprecedented construction activity due to various post-insecurity concerted efforts by various government as well as international organizations. Previous studies in the region, for instance, [7] examined eighteen (18) critical factors limiting the quality of public construction projects in Borno state, one of the eight frontline states in the Lake Chad Basin. However, this present study, examined the impacts of twenty-three (23) quality management success factors on construction project delivery, as well as their effects on ten (10) quality performances measures of construction projects in Yobe state, Nigeria.

Figure 1. The eight affected states, regions and provinces in the Lake Chad Basin countries of Africa [2]

6.0 METHODOLOGY

Research design: According to [16], [17] before choosing a design, a researcher should consider the purpose, objectives, hypotheses/ questions of the study. Hence, the objectives, this survey examined: the relative importance of quality management success factors and their impacts, and determined the effects of quality management success factors on the quality performances of construction projects in the Lake Chad Basin. A descriptive survey methodology was used in this study to elicit responses. Literature was also reviewed to understand the construct of the research problems, objectives and various variables of the study.

Method of data collection: According to [18], [17] questionnaire survey is the most appropriate tool used in capturing large amount of data from people's experience. A well-structured open-ended questionnaire was the tool utilized to gather the data, open ended questionnaires has the ability revealed more variables through addition, suggestions and recommendations by the respondents. A 5-point Likert scale was used, with "1" representing -Very low, "2" Low, "3" Moderate, "4" High and "5" representing-Very high respectively was used. According to [19], and [1], the Likert scale is the scale that is most frequently used in survey research. For this study, twenty-three "quality management success factors", as well as ten "quality performance measures" which are relevant to the study area and the research objectives was used as compiled in table 3 and 4 respectively.

Area of the study: The study was conducted in Yobe state, Nigeria. The state is located in the North-Eastern part of the Country and is one of the eight frontline states in the Lake Chad Basin spanning through the nations of Cameroon, Chad, Nigeria and Niger Republic. Yobe state has a population of approximately 2.67 Million people and 46,609Km^2 of land mass [20]. The state was choosing due to availability and accessibility to respondents. In terms of the impacts of insurgencies and destruction to infrastructures, the state is second only to Nigeria's state of Borno.

Population of the study: Respondents of the study includes; building contractors, clients and consultants all ably represented by experienced and academically qualified construction professionals and personnel in areas such as: Architecture, Building, Engineering, Quantity Surveying, and Planning and Estate Management. Due to the peculiarities of the study location, 80 samples of questionnaires were distributed using the convenience and snowball sampling technique approaches to the accessible construction experts in the study area, particularly in the towns of Damaturu the state capital, as well as in major towns such as Nguru, Gashua all in Yobe state. The respondents successfully returned 59 questionnaires in total, which is a response rate of 73.75%, this rate is higher than previous studies in the region, for instance, [1], [19], and [22] respectively.

The data analysis was conducted with the aid of Statistical Package for Social Science (SPSS) software. The SPSS being the most widely used tool, it is easy to operate, comprehend and present data in to various forms. The analysis conducted was in the form of descriptive statistics through the use of tables, percentages, frequencies, relative index as well as inferential statistics in the form of mean item score, standard deviation, Anova and regression respectively. Figure 2 shows the methodological flow chat used in conducting this survey. For this study five (5) grading remark of the impacts of success factors on dependent variables was achieved as developed in Table 4.

Table 4. Rating of success factors

Grading	Remark/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

The relative severity 'impact' index (RSI) of success factors was calculated from a formula adapted from [1], as presented in equation 1, as thus:

$$\text{Relative Severity 'Impact' Index (RSI)} = \frac{1n1 + 2n2 + 3n3 + 4n4 + 5n5}{Y * (N)} \quad (1)$$

where:

n_1 = Number of respondents that chooses 'Very low' scale

n_2 = Number of respondents that chooses 'low' scale

n_3 = Number of respondents that chooses 'moderate' scale

n_4 = Number of respondents that chooses 'high' scale

n_5 = Number of respondents that chooses 'Very high' scale

Y = The Likert scale with the highest value, as such 5

N = Total of number respondents that participated in the study, as such 59.

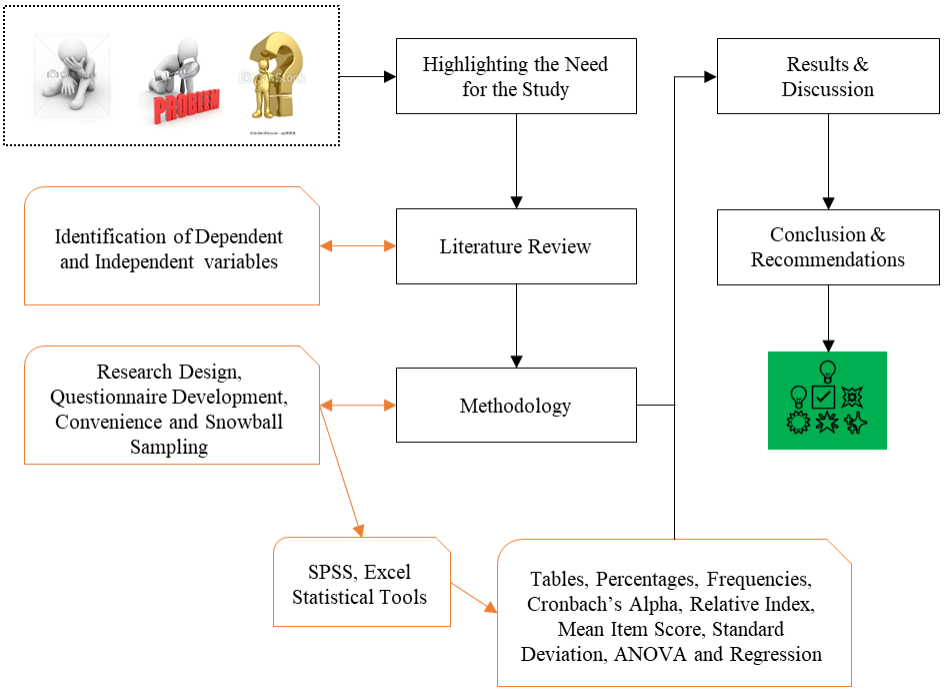

Figure 2. Research methodology flow chart

7.0 RESULTS

Table 5 shows the Bio-data characteristics of the respondents. Findings revealed that, both the public and private sector construction professionals took part in the study, with the Architecture having 15.3% representation, Engineering -37.3%, Quantity surveying -10.2%, Building -11.9%, while the Planning, Planning and Estate Surveying professionals were represented by 25.4% of the respondents. Also, the Contracting organization, Client, and the Consultanting

organization were each represented by 25.4%, 50.8% and 23.7% of the professionals respectively. In terms of academic qualifications of the respondents: 10.2% have Certificate /or National Diploma, 45.8% have First Degree/ or High National Diploma, 30.5% claimed to have obtained Master's degree/or Post Graduate Diploma, while 13.6% are PhD holders. Respondents years of working experience: 18.6% have 1-5years working experience, 50.8% have 6-10years, while 30.5% claimed to have more than 16 years of working experience.

Table 5. Bio-data of respondents

Categories	Features	Frequency	Percentage
Highest Academic Qualifications	Certificate/ Diploma	6	10.2
	Degree/Higher National Diploma	27	45.8
	Masters/Post Graduate Diploma	18	30.5
	PhD	8	13.6
	Total	59	100.0
Area of Profession	Architecture	9	15.3
	Engineering	22	37.3
	Quantity surveying	6	10.2
	Building	7	11.9
	Planning, Estate Surveying	15	25.4
	Total	59	100.0
Years of working experience	1-5 years	11	18.6
	6-10 years	18	30.5
	11-15 years	12	20.3
	More than 16 years	18	30.5
	Total	59	100.0
Working Organization	Clients organization	15	25.4
	Consultants organization	30	50.8
	Contractors organization	14	23.7
	Total	59	100.0

Table 6 depicts the reliability test results. The study utilizes Cronbach's Alpha (α) coefficient. An internal consistency reliability was achieved, with a remarkably high consistency 0.953α on 'quality management success factors' which is the independent variables, as well as 0.861α on 'quality performance of construction project', which is the dependent variable of the study. According to [17], less than 0.5 indicates poor reliability; 0.5-0.7 sufficient and greater than 0.7 indicates good reliability.

Table 6. Reliability test of the study variables

Factors	No. of items	Cronbach's alpha (α)	Remark
Quality Management success factors	23	0.953	Very good
Quality performance measures	10	0.861	Very good

Table 7 present the results of the impacts of quality management success factors on the performance of construction projects. Findings revealed that seven (7) of the factors have 'high impacts' while the remaining have 'moderate impacts' on the quality performance construction projects in the study area. Further findings revealed that, the success factors with the high impact are: project manager's previous work experience and supervision skills, with a mean score 'MS' 3.90 and standard deviation 'SD' 0.84; Project manager's technical competence and good leadership skills, with Mean Score 'MS' 3.75/ Standard Deviation 'SD' 0.84; taking appropriate security measures on project site, with 'MS' 3.73/ 'SD'1.14; project planning, monitoring and evaluation, with 'MS' 3.68/ 'SD' 1.04; project team technical capabilities, with MS 3.59 and SD 0.98. while the success factors with the least 'moderate impacts' on quality performance are: application of latest techniques and innovations for project operation, with MS 3.15/ SD 1.16, and conformance to codes, standards and regulations, with MS 3.14/ SD 1.32 respectively. These findings agreed with results from most recent studies reviewed, for instance [1], [11], [19].

Table 7. The impacts of quality management success factors

Success factors	Mean	Std. Dev.	Remark
• Deployment of skilled workers	3.41	1.12	Moderate
• Application of latest techniques and innovations for project operation	3.15	1.16	Moderate
• Conformance to codes, standards and regulations	3.14	1.32	Moderate
• Deployment of plants, equipment and machineries for project operations	3.36	1.03	Moderate
• Maintenance of plants, equipment and machineries	3.25	1.06	Moderate
• Commitment by all stakeholders to the project objectives	3.37	1.27	Moderate
• Well defined individual responsibilities	3.41	0.91	Moderate
• Setting realistic project scope	3.44	1.02	Moderate
• Project manager's technical competence and good leadership skills	3.75	0.84	High
• Project manager's previous work experience and supervision skills	3.90	0.84	High
• Project team technical capabilities	3.59	0.98	High
• Top management support	3.37	1.22	Moderate
• Consideration of the size, type and nature of the project	3.22	1.04	Moderate
• Project planning, monitoring and evaluation	3.68	1.04	High
• Awarding contract to competent contractors and suppliers	3.25	1.28	Moderate
• Using appropriate procurement methods for project delivery	3.39	1.14	Moderate
• Completeness and consistency of design documents	3.59	1.00	High
• Clear and well detailed contract documents	3.53	0.99	High
• Availability of materials and financial resources	3.44	1.18	Moderate
• Proper mechanism for ensuring transparency and accountability	3.20	1.10	Moderate
• Effective prioritization of project activities	3.19	0.97	Moderate
• Effective communication	3.44	1.24	Moderate
• Taking appropriate security measures on project site	3.73	1.14	High

Table 8 presents result of the relative severity index of quality management success factors. Findings revealed that the factor with the most severe impact on the quality performance of construction projects is 'Project manager's previous work experience and supervision skills, with 77.97% impact' and was ranked 'first' while the least severe success factor is 'Conformance to codes, standards and regulations, with 62.71% impact'. Further findings revealed that seven (7) of the success factors, which includes: project manager's technical competence and good leadership skills; taking appropriate security measures on project site; project planning, monitoring and evaluation; project team technical capabilities; completeness and consistency of design document; and clear and well detailed contract documents, have more than 70.00% relative impacts each on the quality performances of construction projects in the study area.

Table 8. Relative severity index 'RSI' of quality management success factors

Success factors	RSI	Impact %	Rank
• Project manager's previous work experience and supervision skills	0.7797	77.97	1
• Project manager's technical competence and good leadership skills	0.7492	74.92	2
• Taking appropriate security measures on project site	0.7458	74.58	3
• Project planning, monitoring and evaluation	0.7356	73.56	4
• Project team technical capabilities	0.7186	71.86	5
• Completeness and consistency of design document	0.7186	71.86	5
• Clear and well detailed contract documents	0.7051	70.51	7
• Setting realistic project scope	0.6881	68.81	8
• Availability of materials and financial resources	0.6881	68.81	8
• Effective communication	0.6881	68.81	8
• Deployment of skilled workers	0.6814	68.14	11
• Well defined individual responsibilities	0.6814	68.14	11
• Using appropriate procurement methods for project delivery	0.6780	67.80	13
• Top management support	0.6746	67.46	14
• Commitment by all stakeholders to the project objectives	0.6746	67.46	14

Table 8. (cont.)

Success factors	RSI	Impact %	Rank
• Deployment of plants, equipment and machineries for project operations	0.6712	67.12	16
• Maintenance of plants, equipment and machineries	0.6508	65.09	17
• Awarding contract to competent contractors and suppliers	0.6508	65.09	17
• Consideration of the size, type and nature of the project	0.6441	64.41	19
• Proper mechanism for ensuring transparency and accountability	0.6407	64.07	20
• Effective prioritization of project task/or activities	0.6373	63.73	21
• Application of latest techniques and innovations for project operation	0.6305	63.05	22
• Conformance to codes, standards and regulations	0.6271	62.71	23

Table 9 shows the regression model summary and the ANOVA result. The model produced overall R-Value of 0.597 and R-Square value of 0.356, with F-statistics of 31.491 which are significant as indicated by ρ-value of 0.000 far below the recommended maximum of 0.05 [21], [22]. This shows that the model predicts about 44.0% of the variation on the effects of quality management success factors, this finding is much higher than similar studies by [22], [1]. The model for this study is statistically significant in forecasting how the influence of quality management success factors will affect the quality performance construction projects in the Lake Chad Basin. The model is fitted well and good as it produced a strong R-Square and F-Statistics values.

Table 9. Regression model summary and ANOVA statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.597[a]	.356	.345	6.18192	31.491	.000

Table 10 shows the results of the effects of Quality management success factors 'the independent variable' on the quality performance of construction project in the Lake Chad Basin 'the dependent variables'. Findings revealed that quality management success factors will have an overall cause-effect of 59.7% on the quality performances of construction in the Lake Chad Basin and is significant at $p < 0.05$. Further findings revealed that, quality performance measures, which include: feedback/ or satisfaction by end users', customers and stakeholders with completed projects; ease of maintaining completed projects; time taking in rectifying defective components and services; minimal or absence of rework; cost of rectifying defective components and services; absence of observable defects after project completion; cost of reworking faulty components during construction work; little or no reports of claims, litigations and disputes after project completion, are all significantly influenced by the effect of quality management success factors on construction projects in the Lake Chad Basin. However, repeat business by re-awarding contractors with similar projects, and number of complaints or recommendations recorded on completed projects, are not significantly influenced by quality management success factors in the Lake Chad Basin.

Table 10. Effects of quality management success factors on construction project quality performance

Model 1	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta (β)		
(Constant)	13.995	3.720		3.762	.000
Quality management success factors	.259	.046	.597	5.612	.000
Individual Quality Performance Measures:					
Repeat business by re-awarding contractors with similar projects	.011	.009	.164	1.257	.214
Feedback/ or satisfaction by end users', customers and stakeholders with completed projects	.030	.007	.483	4.165	.000
Number of complaints or recommendations recorded on completed project	.006	.008	.096	.724	.472
Ease of maintaining completed projects	.020	.008	.312	2.477	.016
Time taking in rectifying defective components and services	.029	.008	.435	3.645	.001
Minimal or absence of rework	.038	.007	.563	5.149	.000
Cost of rectifying defective components and services	.028	.008	.419	3.485	.001

Table 10. (cont.)

Model 1	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta (β)		
Absence of observable defects after project completion	.035	.007	.548	4.952	.000
Cost of reworking faulty components during construction work	.026	.008	.415	3.445	.001
Little or no reports of claims, litigations and disputes after project completion	.034	.007	.528	4.697	.000

8.0 CONCLUSION

This study evaluates the impact of twenty-three (23) quality management success factors on the quality performances of construction project in the Lake Chad Basin, a region in Sahel part of the continent of Africa. The outlined research objectives were achieved, and the research problems which necessitated this study were also addressed. The survey shows that the success factors with 'high' impacts on the quality performance of construction projects are: project manager's previous work experience and supervision skills; project manager's technical competence and good leadership skills; taking appropriate security measures on project site; project planning, monitoring and evaluation; project team technical capabilities; completeness and consistency of design document; clear and well detailed contract documents; setting realistic project scope; and availability of materials and financial resources. The quality management success factors will have an overall 59.7% significant cause-effects influence on the quality performance of construction projects. The most significantly impacted quality performance measures are: minimal or absence of rework; time taking in rectifying defective components and services; satisfaction by end users', customers and stakeholders; absence of observable defects after project completion; cost of rectifying defective components and services; and cost of reworking faulty components during construction work. However, repeat business by re-awarding contractors with similar projects, and number of complaints or recommendations recorded on completed projects, are not significantly influenced by the quality management success factors in the Lake Chad Basin in this study.

The major limitation of this survey, is that it was carried out in Nigeria's state of Yobe. The state which is situated in the Sahel region of North-Eastern Nigeria, Yobe is just one out of the eight states among the four nations of the Republic of Chad, Cameroon, Niger and Nigeria which are the host nations of Lake Chad.

The main recommendation suggested in this study is that security, desertification, and the receding level of water in the lake chad which has inhibited human, social, capital development in the region should be tackled henceforth, which will encourage massive construction infrastructural development in the region, which has hitherto been in deficits for decades due to neglects occasioned by insecurity which has devastated the region.

Similar studies should also be undertaken in the other Francophone speaking countries of the Lake Chad Basin to compliment the major findings of this present study in the region. In addition, further research in areas such as: cost management success factors, time management factors, quality performance indicators, construction procurement, the challenges of construction project delivery in the Lake Chad Basin, should also be undertaken in order to enrich the existing literature.

9.0 AUTHOR CONTRIBUTIONS

Suleiman Shehu: Conceptualization, Methodology and Supervision.

Rabiu Shehu: Writing- Reviewing and Editing.

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11.0 DATA AVAILABILITY STATEMENT

The data used to support the findings of this study are included within the article.

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13.0 CONFLICTS OF INTEREST

The authors declare no conflict of interest what so ever.

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