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CRITICAL FACTORS AFFECTING QUALITY IN PUBLIC CONSTRUCTION PROJECTS IN BORNO STATE

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Abstract: Quality in construction projects both in the past and in present has assumed critical importance due to frequent cases of failure. Quality in public construction projects in Nigeria is on the decline greatly due to underachievement in the construction management process. The aim of this study is to identify factors affecting quality in public construction projects in Borno state. In achieving the objective of the study, a questionnaire survey was conducted involving a sample size of 70 respondents, which include architects, engineers, quantity surveyors, and contractors. The importance index of each factor was calculated for all the professionals. Percentage rank agreement factor (PRAF) was used to measure agreement of the importance ranking among the professionals. The results show the most critical factors affecting quality in public construction projects in Borno state are; 'lack of management commitment', 'poor teamwork among project participants', 'poor supervision by contractor', 'design changes and 'poor training system'. Respond of the professionals' perspective on factors affecting construction quality in public projects in Borno state is the very first important step in initiating methods and processes for improvement of quality in public construction projects in Borno state.

Keywords: *Construction projects, project quality, construction professional, quality defects, quality improvement, Borno state*

1.0 Introduction

Quality in construction projects has a different definition from that of the manufacturing or services industries. Quality in construction projects involves not only the quality of the constructed facility but also involves the entire management approach followed in completing the construction of the facility. The quality of a construction project solely depends on the control practice adopted which is the primary duty of the contractor (Rumane, 2010).

However, Chung (2002) gave a comprehensive explanation on what quality in construction project is all about. He stated that quality of building work is often very

difficult or impossible to quantify because most construction practice are not numerically assessable. The term of reference generally gives the exact picture of the final product. He also lamented that a building is said to be of good quality as long as it can function for the intended purpose according to its design life. The exact quality of a building is not usually displayed immediately after completion; it takes some years after completion to know the exact quality. Quality of building work is justified according to level of compliance with the contract terms not only contract specifications but also contract sum and contract period. Clients are mostly satisfied when projects are carried out according to contract terms, within budget and time. Hence, a good quality building construction must comply with the entire contractual requirements of the construction project.

Achieving acceptable level of quality in construction projects according to the established quality standard of the project has for long being a problem in the construction industry (Arditi and Gunaydin, 1998). Although many investigations were carried out to identify and improve quality failures in construction, cases of quality failure are constantly recorded in the construction industry (Heravitorbati *et al*., 2011). Studies conducted by Ahmed & Kangari (1995) and Adenikinju (2003) concluded that quality in Nigerian construction projects is on the decline greatly due to the under-achievements in the construction management process, as well as the durability and sustainability of completed projects. The success of every construction project can also be measured in term of it quality achievement according to the established quality standard (Adenuga, 2013). Therefore, taking into consideration the numerous cases of quality failure in public construction projects in Nigeria particularly Borno State, there is the need to improve the present compliance to quality standard in public construction projects. As such, this study intends to find out the factors affecting quality in public construction in Borno State.

The study was primarily carried out within Borno state, Nigeria. The scope of the study for achieving the objective focused on factors affecting quality in public construction projects in Borno state. Attention was given only to public building construction projects in Borno state excluding other construction projects. The scope of this study covered mainly construction industry professionals involved in managing government construction projects in Borno state.

2.0 Literature Review

Researchers have identified different factors affecting quality in construction projects. Arditi and Gunaydin (1998) mentioned that the most influential factors affecting quality in construction projects are in the design phase and construction phase of the project. From the literature review on factors affecting quality in construction projects,

seventeen factors affecting quality in construction projects with respect to the case study of this research were selected since there is no any comprehensive set of factors affecting quality in construction projects either in the design phase or in construction phase of a construction project. The level of management commitment in promoting quality cannot be underestimated because of its significance in ensuring high quality performance in the construction phase of the project (Arditi and Gunaydin, 1998). According to Crosby (1992), there is the need to introduce the attitude of continuous quality improvement. Quality improvement process is one the most significant process in total quality management. Oberlender (1993) mentioned that high quality is only achievable when there is full management commitment and participation in the implementation of quality programs.

The cooperation and coordination between the project team within the same organization is important. In the construction phase, teamwork plays a vital role in avoiding conflicts within the project team (Arditi and Gunaydin, 1998). Working as a team collectively improves the quality of construction process, improve construction techniques and productivity which leads to reduction in the amount of rework and decrease cost (Deming, 1986). Inadequate level of coordination frequently results in overlapping activities, materials shortage and inefficient resource allocation (Arditi and Gunaydin, 1998). The ultimate goal of working together as a team is to involve everybody and focus on continuous quality improvement (Deming, 1986).

Supervision by contractor is significant particularly when the works are subcontracted to a number of subcontractors in order to avoid lack of information on subcontractor's work, overlapping activities, which might lead to reworks, high costs, and low quality performance. Effective coordination by the contractor and improved communications might reduce the probability of occurrence of such problems and increase effectiveness of contractor's supervision (Arditi and Gunaydin, 1998). A central database system for project control and supervision may improve the quality of supervision by the contractor (Shtub, 1995).

Training the staff at every level with the aim of achieving high quality in the construction phase of the project is very important. The training of labourers, site engineers and other construction industry trade on basic quality concepts may improve project quality performance. Training involves not only a change from the traditional way of doing things but also changes the culture of the organisation (Arditi and Gunaydin, 1998). According to Pike and Barnes (1995), training on quality should involve the entire management team. Juran and Gryna (1993) emphasized that senior managers should undergo training for quality first. For quality to be an essential part of construction project, there is the need to educate the project team on total quality management theory in detail since the effective solution to quality problems in construction is training (Kubal, 1994).

Unrealistic constraints of project time and cost affect the design phase which in turn might affect the quality of the completed facility (Oyedele *et al.*, 2012). According to Ferguson and Mitchell (1986) producing design within a short period of time due to time constraint might affect the quality of the design unless a quick to build contracting system has already been made. Design budget constraints might also affect the quality of the design. Most clients prefer iconic design that are unique but tend to budget low for the design. Hence, due to the low design budget, the design professional is compelled to produce a design according to the budget, which might affect the quality and may not comply with the project requirements of the client.

Table 1**:** Factors affecting quality of construction projects

Factors affecting quality in construction projects	Authors
Lack of management commitment	(Arditi and Gunaydin, 1998, Oberlender, 1993, Crosby, 1992)
Poor teamwork among project participants	(Arditi and Gunaydin, 1998, Deming, 1986, Ferguson and Clayton, 1988)
Poor supervision by contractor	(Arditi and Gunaydin, 1998, Shtub, 1995)
Design changes	(Love and Irani, 2003, Oyedele *et al*., 2012)
Poor training system	(Arditi and Gunaydin, 1998, Kubal, 1994, Juran and Gryna, 1993)
Unrealistic project constraints	(Ferguson and Mitchell, 1986, Oyedele *et al*., 2012)
Poor quality of construction materials/equipments	(Enshassi *et al*., 2009, Janipha and Ismail, 2013)
Lack of quality assurance	(Oyedele *et al*., 2015)
Selection of contractor	(Russell and Skibniewski, 1990, Kumaraswamy, 2006, Arditi and Gunaydin, 1998)
Defects in drawings and specifications	(Sui Pheng and Ke-Wei, 1996, Ferguson and Clayton, 1988, Arditi and Gunaydin, 1998)
Poor project specifications	(Arditi and Gunaydin, 1998, Brandon and Betts, 1995, Ferguson and Clayton, 1988, Sidwell, 1984)
Lack of architect/engineer involvement	(Arditi and Gunaydin, 1998, Wong, 1999)
Inappropriate method of contractor	(Arditi and Gunaydin, 1998, Sui Pheng and Ke-Wei, 1996)
Lack of constructability review of design	(Arditi and Gunaydin, 1998, Ferguson and Clayton, 1988, Kubal, 1994, Oberlender, 1993)
Poor communication among participants	(Alarcon-Cardenas and Ashley, 1992, Arditi and Gunaydin, 1998, Covey, 1989)
Selection of design professional	(Arditi and Gunaydin, 1998, Ferguson and Clayton, 1988)
Effects of code and standards on quality	(Oyedele *et al*., 2015, Kubal, 1994)

3.0 Methodology

3.1 Questionnaire Survey

The survey method was used to get response from professionals involved in public construction projects in Borno state. The questionnaire comprises of two sections. The first section consists of respondent's professional information such as profession, academic qualification, and years of site experience, number of projects completed and membership of professional bodies. While in section two of the questionnaire each professional was asked to rate the severity of each factor on a five point Likert scale varying from 1 to 5 and rate the frequency of occurrence of each factor on five point Likert scale varying from 1 to 5.

3.2 Sample Characteristics

A random sampling of construction industry professionals undertaking Government construction projects in Borno state was carried out. A total number of 100 experienced Nigerian professionals were targeted in the survey, comprising 25 each of architects, engineers, quantity surveyors and contractors. The professionals who answered the questionnaire were architects, engineers, quantity surveyors and contractors. Due to location difference, the questionnaire was sent through electronic mail via a third party, there and then the questionnaire was distributed to the professionals. A total number of 100 questionnaires were distributed to professionals in Borno state, from which 70 questionnaires were retrieved. As shown in table 2 below, the average response rates were 68%, 80%, 60% and 72% for architects, engineers, quantity surveyors and contractors' respectively. This was considered adequate for analysis based on the declaration by Moser and Kalton (1971) that the result of survey could be considered as biased or less important if the return rate is lower than forty to fifty percent.

Table 2: Questionnaire distribution

Professionals	Number distributed	No of responses	Percentage return
Architects	25	17	68.0
Engineers	25	20	80.0
Quantity surveyor	25	15	60.0
Contractor	25	18	72.0
Total	100	70	70.0

3.3 Data Analysis

After collecting data from the questionnaire survey, importance of each factor was computed by multiplying the severity and frequency of each factor using the formula below:

$$\text{Importance (I)} = \text{Severity (S)} \times \text{Frequency } (F) \quad (1)$$

The data was analyzed using the following methods:

1. Reliability of data obtained to test the internal consistency of the scale used for measuring the factors
2. Comparison of ranking among professionals using severity index, frequency index and importance index
3. Percentage rank agreement factors (PRAF) to measure the agreement in the importance ranking among the professionals

3.3.1 Reliability analysis

Reliability analysis was carried out to study the properties of measurement scale and items that constitute the questionnaire. The Cronbach alpha internal consistency reliability in Statistical Package for Social Sciences (SPSS) was used. The alpha has a reliability coefficient, which ranges from 0 to 1. Higher value of alpha indicates greater internal consistency of reliability (George, 2003).

Table 3: Scale for internal consistency acceptance

Cronbach Alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.7 \leq \alpha < 0.9$	Good
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable

(Source: George, 2003)

3.3.2 Comparison of Ranking among Professionals

Severity index, frequency index and importance index was used to rank the relative severity, frequency and importance of each factor respectively. These indexes were derived according to the formula described by Oyedele et al. (2015). The indexes are expressed mathematically as follows:

$$\text{Severity Index (SI)} = \frac{\sum(s)}{NS} \times 100\% \quad (2)$$

$$\text{Frequency Index (FI)} = \frac{\sum(f)}{NF} \times 100\% \quad (3)$$

$$\text{Importance Index (II)} = \frac{\sum(sf)}{NSF} \times 100\% \quad (4)$$

Where: s = severity rating (ranging from 1"not severe" to 5"extremely severe"), f = frequency rating (ranging from 1"not frequent" to 5"extremely frequent), S = highest severity rating, F = highest frequency rating and N = total number of responses for that particular factor.

3.3.3 Percentage Rank Agreement Factor (PRAF)

To have a common agreement in the ranking of all factors, rank agreement factor (RAF) and percentage rank agreement factor (PRAF) was used to quantitatively measure the agreement in the importance ranking among the architects, engineers, quantity surveyors and contractors. RAF and PRAF were mathematically computed using the below formulas:

$$RAF = \frac{\sum(AEQC)}{N} \quad (5)$$

$$PRAF = \frac{RAF_{max} - RAF_i}{RAF_{max}} \times 100\% \quad (6)$$

Where: RAF_{max} = maximum RAF, ∑AEQC = sum of the order of rankings by architects, engineers, quantity surveyors and contractors, N = number of variable factors ranked.

4.0 Results and Discussion

4.1 Reliability Analysis

The properties of the measurement scales and the items that constituted the questionnaire were studied using Cronbach alpha in SPSS. From the reliability analysis shown in table 4, Cronbach alpha is 0.865, which indicates that the measurement scales and items of the questionnaire are consistence with the responses according to George (2003) scale of internal consistency acceptance.

Table 4: Reliability analysis

Cronbach Alpha	No of items
0.865	17

4.2 Comparison of Ranking among Professionals

From the questionnaire survey completed by the respondents, each professional ranked the factors affecting quality in public construction projects in Borno state according to the severity and frequency of each factor. After the ranking, the importance of each factor was calculated. Using the formulas descried in the methodology, the severity index, frequency index and importance index of each factor was calculated for each group of professionals. The tables (from table 5 – table 8) below show the indexes for each group of professionals.

In the terms of severity of factors across the group of the professionals, poor teamwork among projects participants was ranked first by architects and contractors and was ranked eighth most severe factor affecting quality in public construction projects in Borno state by engineers and quantity surveyors. Lack of management commitment was ranked the most severe factor by quantity surveyors while engineers ranked poor project specifications and inappropriate method of contractor the most severe factors affecting quality in public projects in Borno state. Lack of management commitment is a severe factor affecting quality in public construction projects in Borno state according to the ranks given to the factor by the professionals with the exception of contractors. From the contractors' point of view, lack of management commitment is one of the least severe factors affecting quality in public construction projects in Borno state. This may be due to contractors not wanting to change from the traditional work process and prefer every project participant to do his work separately. Architects, engineers and quantity surveyors collectively ranked effects of code and standards on quality as one of the least severe factors affecting quality, whereas contractors ranked effects of code and standard

on quality as the sixth most severe factor affecting quality in public construction projects in Borno state.

In terms of frequency of occurrence of the factors, both engineers and contractors ranked poor training system the most frequent factor affecting quality in public construction projects in Borno state while on the other hand both architects and quantity surveyors ranked lack of management commitment the most frequent factor affecting quality in public construction projects in Borno state. The contractors and engineers ranking of poor training system can be attributed to their direct relationship with the workmanship. However, all group of professionals' in general have ranked poor training system in their top five frequent factors affecting quality in public construction projects in Borno state. Architects, contractors and quantity surveyor have all ranked design changes as a frequent factor affecting quality with the exception of engineers.

In terms of the overall importance of the factors, architects and quantity surveyors ranked lack of management commitment the most important factor affecting quality in Public construction projects in Borno state. Whereas engineers and contractors ranked poor training system and poor teamwork among project participants respectively as the most important factors affecting quality in public construction projects in Borno state. Architect, engineers and quantity surveyors ranked lack of management commitment in their top two most important factors affecting quality in public construction projects in Borno state. Contractors ranked lack of management commitment as sixteenth important factor affecting quality. Both the quantity surveyors and the contractors ranked inappropriate method of contractor as the least important factor affecting quality in public construction projects in Borno state. While architects ranked selection of contractor as the least important factor affecting quality and engineers ranked lack of architect/engineer involvement as the least important factor affecting quality in public construction projects in Borno state.

Table 5: Indexes and ranks for architects' responses

Factors	SI	SR	FI	FR	II	IR
Poor quality of construction materials/equipments	80.00	5	74.12	2	60.94	5
Lack of constructability review of design	75.29	13	64.71	14	54.59	11
Effects of code and standards on quality	77.65	11	68.24	10	56.00	9
Design changes	80.00	5	72.94	3	63.06	3
Defects in drawings and specifications	78.82	9	67.06	12	55.06	10
Poor communication among participants	72.94	16	65.88	13	49.41	16
Inappropriate method of contractor	82.35	3	71.76	5	60.24	6
Lack of quality assurance	80.00	5	70.59	6	58.59	8
Lack of management commitment	84.71	2	77.65	1	67.76	1
Poor project specifications	74.12	15	70.59	6	54.12	13
Unrealistic project constraints	81.18	4	70.59	6	61.88	4
Poor training system	75.29	13	64.71	14	53.41	14
Selection of design professional	78.82	9	63.53	16	52.71	15
selection of contractor	72.94	16	61.18	17	48.94	17
Poor supervision by contractor	80.00	5	70.59	6	60.24	6
Lack of architect/engineer involvement	76.47	12	68.24	10	54.35	12
Poor teamwork among project participants	87.06	1	72.94	3	65.41	2

Table 6**:** Indexes and ranks for engineers' responses

Factors	SI	SR	FI	FR	II	IR
Poor quality of construction materials/equipments	86	6	82	3	71.00	4
Lack of constructability review of design	84	9	72	13	62.80	10
Effects of code and standards on quality	76	16	67	15	55.40	16
Design changes	76	16	73	12	57.60	14
Defects in drawings in specifications	88	4	76	7	67.40	7
Poor communication among participants	78	14	74	11	60.40	11
Inappropriate method of contractor	90	1	75	9	68.20	6
Lack of quality assurance	86	6	84	2	72.40	3
Lack of management commitment	89	3	82	3	73.20	2
Poor project specifications	90	1	77	5	69.60	5

Table 6 (cont')**:** Indexes and ranks for engineers' responses

Unrealistic project constraints	80	11	75	9	59.80	12
Poor training system	87	5	86	1	75.60	1
Selection of design professional	80	11	66	16	55.60	15
selection of contractor	80	11	77	5	65.80	8
Poor supervision by contractor	81	10	71	14	59.20	13
Lack of architect/engineer involvement	78	15	66	16	53.80	17
Poor teamwork among project participants	85	8	76	7	65.40	9

Table 7: Indexes and ranks for quantity surveyor's responses

Factors	SI	SR	FI	FR	II	IR
Poor quality of construction materials/equipments	73.33	6	72.00	5	56.00	6
Lack of constructability review of design	65.33	14	64.00	13	48.27	14
Effects of code and standards on quality	61.33	17	61.33	16	42.67	16
Design changes	69.33	12	74.67	2	56.53	5
Defects in drawings and specifications	69.33	12	72.00	5	54.13	11
Poor communication among participants	62.67	16	64.00	13	42.93	15
Inappropriate method of contractor	65.33	14	60.00	17	40.53	17
Lack of quality assurance	78.67	2	69.33	12	55.47	8
Lack of management commitment	80.00	1	77.33	1	63.20	1
Poor project specifications	73.33	6	70.67	8	56.00	6
Unrealistic project constraints	72.00	8	72.00	5	55.20	9
Poor training system	72.00	8	73.33	4	56.80	4
Selection of design professional	74.67	5	64.00	13	50.67	13
selection of contractor	77.33	3	74.67	2	62.40	2
Poor supervision by contractor	77.33	3	70.67	8	58.40	3
Lack of architect/engineer involvement	72.00	8	70.67	8	53.07	12
Poor teamwork among project participants	72.00	8	70.67	8	55.20	9

Table 8: Indexes and ranks for contractors' responses

Factors	SI	SR	FI	FR	II	IR
Poor quality of construction materials/equipments	74.44	13	75.56	6	57.78	15
Lack of constructability review of design	77.78	12	70.00	12	58.22	13
Effects of code and standards on quality	82.22	6	70.00	12	58.22	13
Design changes	78.89	11	77.78	2	64.00	5
Defects in drawings and specifications	81.11	8	73.33	10	62.89	7
Poor communication among participants	80.00	9	74.44	8	62.89	7
Inappropriate method of contractor	56.67	17	65.56	17	40.22	17
Lack of quality assurance	74.44	13	76.67	4	58.44	12
Lack of management commitment	68.89	16	66.67	16	49.56	16
Poor project specifications	82.22	6	70.00	12	59.56	11
Unrealistic project constraints	83.33	4	76.67	4	64.22	4
Poor training system	73.33	15	81.11	1	61.78	9
Selection of design professional	83.33	4	68.89	15	60.22	10
selection of contractor	84.44	2	72.22	11	63.11	6
Poor supervision by contractor	84.44	2	75.56	6	66.89	2
Lack of architect/engineer involvement	80.00	9	77.78	2	66.44	3
Poor teamwork among project participants	86.67	1	74.44	8	68.22	1

4.3 Percentage Rank Agreement Factor (PRAF)

According to Oyedele *et al.* (2015), the rank agreement factor can be greater than 1 but a rank agreement factor of zero implies a perfect agreement. For the seventeen critical factors affecting quality in public construction projects in Borno state, the maximum RAF = 3.18. The result of rank agreement factor and percentage rank agreement factor of the professionals' are shown in table 9 below. From the table, the professionals ranked lack of management commitment, poor teamwork among project participants, poor supervision by contractor, design changes and poor training system as the five most critical factors affecting quality in public construction projects in Borno state.

Lack of management commitment being the most critical factor affecting quality in public construction projects in Borno state can be rooted to the unwillingness and negligence of the professionals to fully undertake their contractual duties in public construction projects in the state. According to Arditi and Gunaydin (1998), management commitment in continuous quality improvement is highly important in achieving the desired quality of construction projects. Management must participate in

the implementation process of quality programs and be to fully committed to continuous quality improvement (Oberlender, 1993).

Poor teamwork among project participants was ranked by the professionals in the top five critical factors affecting quality in public construction projects in Borno state. This supports the study of Oyedele *et al*. (2012) on design factors influencing quality of building projects in Nigeria, where poor teamwork among project participants was the most critical factor affecting quality in the design and construction stages of a project. The significant of teamwork among project participants was also highlighted by Arditi and Gunaydin (1998) study of factors that affect process quality in the life cycle of building projects.

Poor supervision by contractor was ranked by the professionals the third most critical factor affecting quality in public construction projects in Borno state. The problem of poor supervision by contractor affecting quality of construction projects has been highlighted by Arditi and Gunaydin (1998) to be very critical on project quality, especially when the work is subcontracted to many subcontractors in order to avoid overlapping of activities, reworks, inflated cost and low quality performance.

Design changes were also ranked by the professional in the ranks of top critical factors affecting quality in public construction projects in Borno state. The effect of design changes during construction has been acknowledged by Oyedele *et al*. (2012), where 40% of the respondents mentioned that design changes affects the quality of a building project and mostly happens due to regular changes in the client brief.

Poor training system is the fifth most critical factor affecting quality in public construction projects in Borno state according to the professionals ranking. Oyedele *et al*. (2015) mentioned that the Nigerian construction industry in general is in need of skilled personnel and also highlighted the need for extensive training programs for the construction industry workers at all levels. Other factors that were agreed by the professionals to be critical in affecting quality in public construction projects in Borno state include unrealistic project constraints, poor quality of construction materials/equipments, lack of quality assurance, selection of contractor, defects in drawing and specifications and poor project specifications.

Table 9: Percentage rank agreement factor of professional

S/NO	Factors	Architects	Engineers	Quantity surveyors	Contractors	∑(AEQC)	RAF	PRAF	Ranking order
F1	Lack of management commitment	1	2	1	16	20	1.18	63.0	1
F2	Poor teamwork among project participants	2	9	9	1	21	1.24	61.2	2
F3	Poor supervision by contractor	6	13	3	2	24	1.41	55.6	3
F4	Design changes	3	14	5	5	27	1.59	50.1	4
F5	Poor training system	14	1	4	9	28	1.65	48.2	5
F6	Unrealistic project constraints	4	12	9	4	29	1.71	46.4	6
F7	Poor quality of construction materials/equipments	5	4	6	15	30	1.76	44.5	7
F8	Lack of quality assurance	8	3	8	12	31	1.82	42.7	8
F9	selection of contractor	17	8	2	6	33	1.94	39.0	9
F10	Defects in drawings and specifications	10	7	11	7	35	2.06	35.3	10
F11	Poor project specifications	13	5	6	11	35	2.06	35.3	10
F12	Lack of architect/engineer involvement	12	17	12	3	44	2.59	18.6	12
F13	Inappropriate method of contractor	6	6	17	17	46	2.71	14.9	13
F14	Lack of constructability review of design	11	10	14	13	48	2.82	11.2	14
F15	Poor communication among participants	16	11	15	7	49	2.88	9.4	15
F16	Selection of design professional	15	15	13	10	53	3.12	2.0	16
F17	Effects of code and standards on quality	9	16	16	13	54	3.18	0	`17

5.0 Implication for Practice

Generally when taking into consideration the results of the analysis, most of the factors ranked high by the professionals affecting quality in public construction projects in Borno state could be seen as problems arising from human attitudinal problems and lack of implementable quality standard and quality assurance process. A study conducted by Elinwa and Joshua (2001) suggest that there is the need to create a culture of quality among construction participants in the Nigerian construction industry. The state Government of Borno state in collaboration with some existing professional bodies in the industry should develop a strong quality assurance process and standard, which should be legislated for strict implementation. In addition, the Government should develop a robust standard for commissioning building projects in the state, which should be quality-focused. This will ensure that the public projects requirements are verified, test and confirmed after the construction phase of the project. This can be achieved by setting-up both quality and commissioning authorities and agents that will ensure the successful implementation of quality standards in the construction industry. Finally, the state Government should encourage innovations in the construction industry that will enhance quality process in the design and construction phases of projects.

6.0 Limitation of Study

A clear limitation to the study was the use of quantitative approach through questionnaire survey in the data collection process. However, this has help in identifying some of the factors affecting quality in public construction projects in Borno state. The questionnaires were distributed only to professional undertaking building construction projects of the Borno state Government. Emphasis were not given to private building construction projects and other construction projects like road construction projects in the state, which might have a different set of factors affecting quality in the construction process and The end-user perspective on factors affecting quality in public construction projects in Borno state. Finally, the study area was focused only on Maiduguri the Borno state capital without taking into consideration public construction projects in the local Government areas of the state.

7.0 Conclusion

This research reports the findings of the study that was carried out to identify the factors affecting quality in public construction projects in Borno state, Nigeria from the professionals' perspective. A total of 17 factors were identified from the literature review and studied through questionnaire survey sent to architects, engineers, quantity surveyors and contractors. The importance of each factor was computed for all the

professionals using the severity and frequency ratings. The data analysis includes comparison of ranking among the professionals using severity index, frequency index and importance index and percentage rank agreement factor (PRAF) was used to measure the agreement in the importance ranking among the professionals. The results show that the top most critical factors affecting quality in public construction projects in Borno state are; lack of management commitment, poor teamwork among project participants, poor supervision by contractor, design changes, poor training system, unrealistic project constraints, poor quality of construction materials/equipments and lack of quality assurance.

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