Influence of Contractor Selection Criteria on Critical Success Factors of Public Project Delivery in Abuja

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There are so many contractors that are not technically and managerially competent. This makes contractor selection processes an onerous task to be performed by the client. Yet, without a proper and accurate method for selecting the most appropriate contractor, the performance of the project will be affected denying clients value for money. Therefore, the study assessed the Influence of contractor selection criteria on critical success factor of public project delivery in Abuja, Nigeria using self-administered structured questionnaires to construction professionals. It was discovered that experience, financial capability, and technical capability are widely considered criteria in the selection process while all the critical success factors for project delivery are very much crucial and that procurement related factors, project stakeholders' related factors, and daily site factors are essential factors to effective project delivery. The study concluded that there exists a significant relationship between the factors considered in selection of contractors and the criteria success factors. Based on the relationship between selection criteria and success factors, there is the need to adopt the selection criteria for each individual project based on project characteristics, client characteristics and external environment for effective project delivery. It is necessary to make good assessment of the technical capacity and experience of the contractors when considering the cost factor for project delivery.

Keywords: Critical success factor, Procurement, Project delivery, Selection criteria, Abuja

INTRODUCTION

The construction industry all over the world constitutes one of the most important sectors in the economy of any country. Oladinrin *et al.* (2012) noted that construction industry plays an important role in the economy, and therefore vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment. Construction activities affect nearly every aspect of the economy and the industry is vital to the continued growth of the economy. It is also well known that the construction industry is a very challenging industry as it is very competitive and unstable during economic down turn (De Valence & Runeson, 2011). Oftentimes, it is perceived to be the enterpriser of its respective economy as it cuts across all aspects of human activities. The Nigerian construction industry is not an exception as its contributions range from enabling the procurement of services to the provision of buildings and other infrastructure, thereby providing employment opportunities to its labour force, while contributing immensely to the Gross Domestic Product (Ikechukwu *et al*., 2017). The National Bureau of Statistics (2019) reported that in the second quarter of 2019, the construction sector contributed about 4.45% to the Gross Domestic Product (GDP) of the economy of Nigeria.

However, Oluwakiyesi (2011) stated that the construction industry is complex and requires proficient professionals that are ready to meet the expectations of their clients. Clients in the construction industry could be private individuals including corporate bodies or public organizations which include the government. Consequently, construction industry is a business arena for both construction and non-construction professionals. This is manifested in the ways construction firms sprang up daily and many that were inexperienced in the business of construction flocked in to make quick money (Ika *et al*., 2012). This implies that there are so many contractors that are not technically and managerially competent. This makes procurement and contractor selection processes an onerous task to perform by the client. Without a proper and accurate method for selecting the most appropriate contractor, the performance of the project will be

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affected denying the client value for money (Cheng & Heng, 2004; Ogunsemi & Aje, 2006).

Alhazini and McCaffer (2000) and Chau *et al*. (2007) maintained that each project has its own characteristics and requirements, and for a project to be successful, the procurement method must address the technical features of the project alongside the clients' and contractors' needs. This reflects a very crucial importance of procurement methods and the contractor selection criteria for the delivery of construction projects.

Sidik (2010) asserted that there is no commensurate improvement in construction project success despite all the procurement and contractor selection methods adopted. Eriksson (2013) also discussed the issue further observed that the absence of competent contractors as a result of in adequate selection process is the key factor responsible for weakness of construction performance and need to be urgently investigated. In the same way, the industry has been criticized for its high costs, inefficiency, ineffectiveness, and delays in project due to the procurement process and the contractor selection criteria being adopted (Adesanya, 2014). It was also observed by Othman (2016) that a large number of projects have been delayed and several have failed due to lack of proficiency and inability of the contractors which is as a result of the absence of adequate selection criteria used for the selection of contractors. This is seen as a vital issue in relation to the achievement of construction projects.

Consequently, one of the most difficult decisions taken by the clients in the construction industry is in the selection of contractors especially in public project with competitive bidding (Zavadska *et al.,* 2014). This is because construction project is characterized by risks and uncertainty; incompetent contractor increases the chances of time and cost overruns, substandard work, disputes, or even bankruptcy (Hatush, 1996; Ajanlekoko & Usman, 2013). Thus, one of the ways of ensuring that a contractor is qualify to execute the assigned project in accordance with client and project objectives is to assess the contractor's capabilities at the prequalification stage and tender evaluation stage. Moreover, given the high number of competitors nowadays, successful execution of bidding process is very crucial (Alsaedi *et al*., 2019).

Doloi (2009) asserted that both researchers and stakeholders from the industry over the time came up with different methods and procedures for selecting contractors: there has been a challenge in creating favourable outcomes for all parties due to inability of the previous studies to link the selection criteria and the project success. To improve and enhance the operations of the Nigerian construction industry, it is necessary to understand the key factors affecting the construction industry and its associated operations. Considering the issues raised, there has been an overwhelming challenges of contractors handling public projects which results into substandard work, cost overrun, delay and abandonment of projects in the construction sector in Abuja, therefore, this study assessed the influence of contractor selection criteria on critical success factors of public project delivery in Abuja, Nigeria through a search for answer to the following question:

Is there any relationship between the factors considered in the selection of contractors and critical success factors (CSFs) of public project delivery in Abuja?

LITERATURE REVIEW

The 2007 Public Procurement Act

Until 2007, Nigeria did not have a statute that specifically regulates public procurement. This led to the enactment of the Public Procurement Act (No. 14) of 2007 which requires public institutions and other relevant parties to ensure that all public procurements are conducted in a manner that is transparent, timely and equitable and based on the agreed guidelines, thresholds and standards (Ekanem & Ekefre, 2015).

Udeh (2015) further reported that the public procurement bill was sent to the National Assembly in 2003 and by 4th June 2007, the Public Procurement Act was passed in Nigeria and it became a watershed in Nigeria's attempt at key governance reform. The PPA Act 2007 is designed primarily after the United Nations Commission on International Trade Law (UNCITRAL) Model Law on Public Procurement. The report on Nigeria's procurement assessment identified some weaknesses in the existing procurement system which included lack of appropriate legislation, shortage of basic skill and inappropriate organisation of the procurement process (World Bank, 2000). The purpose of the PPA Act 2007 is to ensure transparency, competitiveness, value for money and professionalism in the public sector procurement system.

According to Udoma and Bello-Osagie (2012), the essence of the Act is to ensure that all the public procurements are conducted in a manner that is transparent, timely, equitable and based on the agreed guidelines, thresholds and standards observing that the procurement law is to ensure openness of the procurement procedure, free competition of suppliers as well as equal and fair attitude thereto, effective use of state and local government funds and to reduce the risk of the commissioning party to the minimum. The Nigerian Public Procurement Law 2007 is one of the strategic institutional reform agenda that the country embarked upon in recent years. The public procurement law in is divided into thirteen parts. Each of the parts deals with specific previous structural

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defect that have plagued the Nigerian public procurement system over time.

Selection Criteria

Contractor selection is a commonly used procedure for identifying a pool of competitive, competent and capable contractors from which tenders may be sought. It can aid public and private owners in achieving success by ensuring that only qualified contractor are selected to execute the work (Mills, 2011). Cheng and Li (2004) posited that the performance of the project will be highly affected when inappropriate methods are used. Basically, selection criteria are sets of factors or conditions considered in the selection of contractors. They are classified as pre-qualification and project-specific (Alarcon & Mourgues, 2002).

Most times, contractor selection is highly underestimated and neglected in construction (Ng & Wan, 2005). Single criteria cannot give a full expression of goals purposed by various stakeholders (Zavadskas *et al.,* 2014). Most of the past researchers verify that a "price-only" selection of contractor system is inefficient in choosing the most knowledgeable contractors who can execute projects profitably with winning results. Selecting the cheapest bid usually leads to delay, cost over-runs and sub-standard quality and sometimes guides the project to the failure with disputes and escalated claims (El Wardani *et al*., 2006).

Contractor selection and tender assessment continues to be an area of importance and interest to decision makers responsible for delivering project outcomes. occurring early in the project life cycle, it is possibly one of the most serious undertakings performed by clients, the effectiveness of which is directly related to project success and the accomplishment of specified objectives (Watt *et al*., 2010). Hence, the client has the sole duty of selecting the appropriate contractor that will complete a project successfully and it involves a procurement system that comprises project packaging, invitation, pre-qualification, shortlisting and bid evaluation.

The commonly considered criteria includes tender price, financial capability, past performance, past experience, resources, current workload, past relationship and safety performance. However, the eight criteria are interrelated to a certain extent. Some of these criteria can be affected by one another (Bakhshi & Bioki, 2013). For instance, good past experience may lead to good safety performance if the past experience includes good safety records. Good past performances and experiences are good evidence of successful projects, which in turn results in strong financial capability. Resources and financial capability may be positively correlated. Tender price may be negatively related to other criteria, in most studies of contractor selection, the criteria are assumed to be independent of each other.

The Influence of Contractor Selection Criteria on Project Delivery

It has become crucial to have a closer look on the existing practices in awarding construction contracts to contractors and achieving success through project delivery in the construction industry Though many researchers and industry practitioners have come up with different methods and procedures forcontractor selection, most of them have limitations in establishing a relationship between the selection criteria and the project delivery which ought to lead to a win-win situation for all parties (Singh & Tiong, 2006; Wong *et al*., 2008).

Hatush and Skitmore (1997) assessed the perceived relationship between 20 contractor selectioncriteria under three main project success categoriesin terms of time, cost and quality. An extended interview questionnaire approach was adopted and a total ofeight construction industry experts were interviewed in the project. The expected mean and variance values ofeach criterion in terms of time, cost and quality impacts were analysed and 90%, 95% and 99% confidenceintervals were calculated. Past failures wererereported to be the single most critical factor across all three project success categories; while management safety accountability was identified as the leastcontributing factor in contractor selection with regards to their influence on the three success measures. Though, the study represented an important first step towards measuring the impacts of all selected criteria on project success factors, non-identificationof the critical attributes influencing time, cost and quality success made the expediency of the research incomplete.

A study by Doloi (2009) to assess the influence of contractor selection criteria on project delivery. The relative significance and impacts of the attributes were determined using a structured questionnaire survey in selected construction projects. After the factor analysis was done, a total of seven factors significant to contractors' performance were extracted, specifically: soundness of business and workforce; planning and control; quality management; pastperformance; risk management; organizational capability; and commitment and dedication.The derived multiple linear regression models revealed that technical expertise, past success, time in business, work

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methodsand working capital had significant impact on contractors' performance in relation to time, cost and quality success.

RESEARCH METHODOLOGY

The study which was part of a larger study that adopted sequential mixed methods design. According to Creswell and Clark (2011), a mixed methods research design involves a process of collecting, analysing, and mixing quantitative and qualitative data when carrying out one or various studies, in order to understand the research problems or questions. However, only the quantitative strand that adopted questionnaire survey is reported here. Survey research involves the collection of information from a sample of individuals through their responses to questions (Saunders *et al.*, 2016). This type of research allows for a variety of methods to recruit participants, collect data, and utilize various methods of instrumentation (Morenikeji, 2006). The survey was carried out among professionals who have been involved in public projects and the selection of contractors. The constructs were derived from the studies of Hatush and Skitmore (1997), Doloi (2009), Dolan (2010), Jiya (2012), Mustaffa (2012), Alinaitwe and Ayesiga (2013), Alvani *et al*. (2014) and Othman (2016).

The population comprised of registered professionals in the construction industry that were based in the study area, namely Architects, Builders, and Quantity Surveyors and the sample size was obtained using the Taro Yamane's formula (Dada *et al*., 2017). The sample size comprised 298 respondents as shown in Table 1. The study adopted the random sampling method which is a method under the probability sampling technique that was chosen so that every member of the parent population would have equal opportunities or chances of been selected in the sample. However, before this process of random sampling was carried out, the number of respondents to be allotted to each of the group of professionals was determined using the proportional stratified random sampling method as used in a study by Dada *et al. (*2017). In order to improve the validity of the questionnaire, pilot study was conducted among five (5) construction professionals that offered suggestions which were later incorporated in the final questionnaire before administration. The questionnaires were self-administered. The data obtained were analysed using factor analysis and canonical correlation that formed the basis for the conclusion and the recommendations reached.

Table 1: Sample size of the respondents

Registered Professionals	Population	Sample size
Architects	631	162
Builders	441	112
Quantity Surveyors	92	24
Total	1164	298

RESULTS AND DISCUSSION

The copies of the questionnaire that were properly filled and returned from the survey were 185 out of 298 copies that were administered. This represented a response rate of 62.1% which is far above the 30% rate, as a satisfactory response rate in construction studies (Williams, 2007).

Demographic Information of the Respondents

The demographic information of the respondents are presented in Table 2. Based on their age brackets, the conclusion of the study will be satisfactory, since over 70% of the respondents are advanced enough to understand the system of contractor selection in Nigeria over the years.

The table shows that the respondents are qualified through experience, expertise and training to give the relevant information needed for the study. It is also seen that all the respondents were affiliated to their respective professional bodies which are the Nigerian Institute of Building (NIOB), Nigerian Institute of Quantity Surveyors (NIQS), and the Nigerian Institute of Architects (NIA). This implies that all the respondents were registered professionals in their professions.

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Table 2: Demographic information of respondents

Characteristics	Frequency	Percentage
Respondents' Age		
21-30 years	14	7.6
31-40 years	42	22.7
41-50 years	70	37.8
51-60 years	59	31.9
Above 60 years	0	0
Years of Experience		
1-5 years	15	8.1
6-10 years	36	19.5
11-15 years	44	23.8
16-20 years	59	31.9
21-25 years	31	16.8
Above 25 years	0	0
Educational Status		
OND	0	0
HND	30	16.3
BSc	80	43.2
MSc	59	31.9
PhD	16	8.6
Professional Affiliati0n		
NIOB	66	35.7
NIA	98	53.0
NIQS	21	11.4

Mean item scores for the overall major constructs for factors considered in contractor selection and the critical success factors (CSF) for project delivery

There were 15 major constructs and 77 minor constructs that made up the major constructs in the factors considered in the selection of contractors; in a related development, there were 15 major constructs and 70 minor constructs that were considered in the critical success factors for project delivery. Due to the size of the tables, only the overall mean score values of the major constructs for the two variables are reported in Tables 3 and 4 below.

Factors considered in the selection of contractors

From Table 3, it was observed that the outcome of the professionals' view on factors considered in theselection of contractor were in agreement that all the factors are very important to be considered in order to have an optimum selection of contractors; this is because all the factors scored above the 2.5 average score for high level of agreement. It can be seen by ranks that the professionals were of the view that Experience (Ranked 1st), Financial Capability (2nd), and Technical Capability (3rd), are the foremost factors that are considered in the selection of contractors in the Nigerian construction industry. This study agrees with the study by Rashvand *et al.* (2015) which asserted that financial standing is the most important criterion followed by technical ability and management capability. Also Jiya (2012) concluded that the technical capacity was foremost, followed by financial capacity and reputation. It is pertinent to say that the factors considered in the selection of contractors are interrelated to a certain extent, since some of them can be affected by one another. This study agrees with the study by Fong and Choi (2000) which stated that financial soundness, overall experience, technical capability and adequate organisational capacity as the most important criteria. Cheng and Heng (2004) affirmed that the technical capacity was foremost, followed by financial capacity and reputation. Doloi (2009) opined that technical expertise, deployment of adequate resources, success in past projects and sound programming are major attributes considered in assessment of contractors. In a related development, Othman (2016) also revealed that experience and financial stability were the most important factors, followed by the reputation, technical and management stability thus, aligning with this study.

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Table 3: Factors considered in the selection of contractors

Variable	Overall mean	Rank
Experience	4.58	1
Financial Capability	4.39	2
Technical Capability	4-27	3
Past relationship with client and others	3.84	4
Reputation	3.51	5
Past failures	3.49	6
Personal capability	3.40	7
Project management organisation	3.29	8
Management capability	3.28	9
Organisational culture	3.25	10
Plant and equipment availability	3.25	10
Quality control and assurance	3.24	12
Health and safety capability	3.22	13
Past performance and quality of work	3.22	13
Management knowledge	3.19	15

Critical Success Factors (CSFs) for project delivery

From Table 4, the professionals were in agreement that all the factors are very much crucial in the successful delivery of projects; this is because all the factors scored well above the 2.5 average score. It can be seen by ranks that the professionals were of the view that Procurement related factors (Ranked 1st), Project stakeholders related factors (2nd), and Daily site factors (3rd), are the most critical factors that leads to the effective delivery of projects.

Procurement related factors namely method of material procurement, tendering methods,effective contract administration, clear and detailed procurement process are critical factors in successful delivery of project which is in consonance with the works of Tan and Gazali (2013) and Adnan *et al*. (2014) that opined three (3) attributes used to measure procurement related factors, these attributes are the procurement method (selection of the organization for the design and construction of the project), tendering method (procedures adopted for the selection of the project team and in particular the main contractor) and contracting mechanism.

Akpan and Igwe (2001) in a study concluded that inadequate planning is the bane of successful projects in the Nigeria construction industry. Haughey (2014) revealed that the adequate planning factors is a critical factor for success because it provides the following benefits; clearly documented project milestones and deliverables, valid and realistic timescale, allows accurate cost estimates to be produced, detailed resource requirements, acts as an early warning signal and keeps the project team focused, while keeping eye on the progress of the project. Nasir and Sahibuddin (2011) asserted that lack of realistic tender prices, estimate of schedules and budget contributes to failure of most projects. In a related development, Monyane and Emuze (2015) identified human induced decision in procurement related factors as factors hindering effective project delivery. It is also pertinent to say that the selection of the organization for the design and construction of the projects, procedures adopted for the selection of the project team and in particular the main contractor) and contracting mechanism, have direct effects on the completion period and achieving value for money. This reflects that the Procurement related factors, project stakeholderand daily site factors have serious contributory roles to the successful delivery of projects in the Nigerian construction industry.

Table 4: Critical Success Factors (CSF) for project delivery

Variable	Overall mean	Rank
Procurement related factors	4.65	1
Project stakeholders related factors	4.59	2
Daily site factors	4.55	3
Contractor resource availability factors	4.55	3
Managerial related factors	4.55	3
Adequate planning factors	4.53	6
Local factors	4.53	6
Project risk related factors	4.50	8
Project management factors	4.48	9
Technical related factors	4.43	10
Incentive related factors	4.42	11
Performance related factors	4.39	12
Quality and standard factors	4.39	12
Realistic estimates of schedule and cost	4.39	12
External factors	4.34	15

Factor analysis for factors considered in the selection of contractors and the CSFs for project delivery

First of all, the factorability and suitability of these variable for factors analysis was carried out. The sample size of 185 and number of variables (number of items) ranging from 75 to 77 were adequate and subsequently considered satisfactory for factor analysis. This decision was based on the reports of (Pallant, 2011; Tabachnick & Fidell, 2017; Hair *et al.,* 2010). The values of Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity, are another way of determining the factorability of data for factors analysis. A KMO value between 0.5 and 0.7 is adequate, while lower than 0.5 is considered to be unsuitable for factor analysis, while, a Bartlett's test of sphericity with p-value (or sig.) of less than 0.05 as ideal. Based on these, it shows that the

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data are suitable for factor analysis as seen in Table 5 below.

Table 5: KMO and Bartlett's Test

Variables	Bartlett's Test of Sphericity			KMO
	Approx. Chi-Square	Df	Sig.	
Factors considered in the selection of contractors	382.78	105	0.00	0.70
Critical Success Factors (CSFs) for project delivery	395.87	105	0.00	0.81

As shown in Table 6, the communalities, which can be regarded as indications of the importance of the variables in the analysis, are generally high above 0.50. This shows that the variables, selected apart from financial capacity (40.7) and Reputation (44.6) for this study are appropriate and relevant in the selection of contractors. According to Cliff and Pennel (1967), communality is the important determinant when stability is the main issue as higher communality does not only entail larger stability but that there is the improvement of the loadings due to the stronger factors. In a related development, Pallant (2011) concluded that communalities give information about how much of the variance in each item is explained. When items with low communality values are removed, the total variance explained is increased.

Table 6: Communalities of the contractors' selection criteria variables

	Communalities	
	Initial	Extraction
Technical Capability	1.000	.649
Financial Capability	1.000	.407
Health and Safety Capability	1.000	.660
Reputation	1.000	.446
Management Capability	1.000	.579
Organisational Culture	1.000	.518
Experience	1.000	.719
Project Management 0rganisati0n	1.000	.640
Management Knowledge	1.000	.576
Plant and Equipment	1.000	.757
Past Failure	1.000	.655
Past Performance and Quality	1.000	.647
Personnel Capability	1.000	.619
Quality Control and Assurance	1.000	.491
Past Relationship with client and others	1.000	.904

From Table 7, the factor analysis procedures with Varimax rotation applied to the data yielded a six-dimensional solution (Extracted factors). This was done using the Eigen value of not less than one for the extraction. The six factors which altogether accounted for 61.78% of the total variance in the 15 original variables may be regarded composite indicators defining factors for the selection of contractors.

Factor 1: Personnel Reputation and Assurance

Table 7 revealed that this factor accounted for 14.19% of the total variance and it is without doubt the most important factor. out of the 15 variables, four variables loaded positively strong on this factor. They include Reputation, past failure, personnel capacity, Quality Control and Assurance.

Factor 2: Organisational Safety and Performance

This factor accounted for 13.49% of the total variance. It includes variables such as Health and Safety, Project Management organisation, organisational Culture, and Performance and Quality.

Factor 3: Managerial Knowledge

This factor includes Management capacity and Management Knowledge. It accounted for 10.67% of the total variance in the dataset.

Factor 4: Technical Experience

This factor accounted for 8.51% of the total variance. Two variables out of the original 15 variables loaded positive on this factor which are Technical Capacity and Experience. Hence, it was named Technical Experience.

Factor 5: Project Management and Equipment

This factor loaded positive on two variables which accounted for 7.8% of the total variance. The two variables include Project Management organisation, and Plant and Equipment.

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Factor 6: Past Relationship with Client and others
only one variable loaded positively on this factor. This variable single-handedly accounted for 7.12% of the total variance. The dominance of Past Relation with Client and others was used to name this factor. The relative importance of the factors considered for selection of contractors is shown by their Eigen values, which indicated that factor one is more important followed by factor two and so on.

Table 7: Eigen value extraction for contractors' selection criteria

Total Variance Explained									
	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.887	19.247	19.247	2.887	19.247	19.247	2.128	14.185	14.185
2	1.748	11.652	30.898	1.748	11.652	30.898	2.023	13.485	27.670
3	1.318	8.785	39.684	1.318	8.785	39.684	1.601	10.672	38.342
4	1.226	8.171	47.855	1.226	8.171	47.855	1.277	8.513	46.855
5	1.089	7.258	55.113	1.089	7.258	55.113	1.171	7.804	54.659
6	1.000	6.669	61.782	1.000	6.669	61.782	1.069	7.123	61.782
7	.923	6.155	67.938						
8	.785	5.231	73.169						
9	.736	4.905	78.074						
10	.686	4.574	82.648						
11	.627	4.179	86.827						
12	.602	4.016	90.843						
13	.507	3.382	94.225						
14	.436	2.907	97.131						
15	.430	2.869	100.000						

As shown in Table 8, the communalities, which can be regarded as indications of the importance of the variables in the analysis, are generally high above 0.50. This shows that the variables selected for this study are appropriate and relevant for critical success factors of project delivery.

Table 8: Communalities of the critical success factors variables

Communalities		
	Initial	Extraction
Project Management	1.000	.941
Adequate Planning	1.000	.836
Procurement related	1.000	.882
External Factor	1.000	.884
Project Stakeholder	1.000	.885
Daily Site	1.000	.921
Contractor Resources availability	1.000	.944
Project risk related	1.000	.782
Performance related	1.000	.957
incentive related	1.000	.934
Managerial Related	1.000	.924
Technical related	1.000	.831
Quality and Standard related	1.000	.941
Location Factor	1.000	.951
Realistic estimated cost and schedules in terms of labour rate	1.000	.965

From Table 9, the factor analysis procedures with Varimax rotation applied to the data yielded a six-dimensional solution (Extracted factors). This was done using the Eigen value of not less than one for the extraction. The six factors which altogether accounted for 90.52% of the total variance in the 15 original variables may be regarded composite indicators defining CSFs for project delivery.

Factor 1: Technical and Location Factor
The technical and location factor accounted for 17.39% of the total variance and it is without doubt the most important factor. out of the 15 variables, two

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variables loaded positively strong on this factor. They include Technical Related and Location Factor.

Factor 2: Planning and Procurement Factor

This factor accounted for 17.13% of the total variance. It includes variables such as Adequate Planning related and Procurement Related.

Factor 3: Standard and Estimated Cost Factor

This factor includes Daily Site, Performance Related, Quality and Standard Related, and Realistic Estimate Cost and Schedules in terms of Labour Rate. It accounted for 16.80% of the total variance in the dataset.

Factor 4: Contractors Resources and Risk Factor

This factor accounted for 16.23% of the total variance. Four variables out of the original 15 variables loaded positive on this factor which are Contractor Resources Availability, Project Risk, Incentives, and Quality and Standard Related. Hence, it was named Contractors Resources and Risk Factor.

Factor 5: Project Management and Performance

This factor loaded positive on two variables which accounted for 12.39% of the total variance. The two variables include Project Management Factor and Performance Related.

Factor 6: External Factor

only one variable loaded positively on this factor. This variable single-handedly accounted for 10.58% of the total variance. The dominance of External Factor was used to name this factor.The relative importance of the critical success factors (CSFs) for project delivery is shown by their Eigen values, which indicated that factor one is more important followed by factor two and others.

Table 9: Eigen value extraction for critical success factors

Total Variance Explained

	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.065	20.434	20.434	3.065	20.434	20.434	2.608	17.388	17.388
2	2.920	19.465	39.898	2.920	19.465	39.898	2.569	17.125	34.512
3	2.724	18.159	58.058	2.724	18.159	58.058	2.520	16.803	51.316
4	2.252	15.013	73.071	2.252	15.013	73.071	2.435	16.232	67.548
5	1.444	9.626	82.697	1.444	9.626	82.697	1.859	12.391	79.939
6	1.173	7.823	90.520	1.173	7.823	90.520	1.587	10.581	90.520
7	.600	4.000	94.520						
8	.473	3.152	97.672						
9	.182	1.215	98.888						
10	.122	.816	99.704						
11	.044	.295	99.999						
12	.000	.001	100.000						
13	1.115E-15	7.434E-15	100.000						
14	4.434E-16	2.956E-15	100.000						
15	-1.594E-15	-1.063E-14	100.000						

Relationship between the factors considered in contractor selection and the critical success factors (CSF) for project delivery

Table 10 shows the test of significance of the linear combination of factors considered for the selection of contractors (X variates) and critical success factor in project Delivery (Y variates) with the aim of accounting for the maximum amount of correlation between the two sets of data X and Y. The result shows that the X and Y set of data were significant with the maximum number of six linear combination extracted with three of the combination significant at 0.05 level. The first linear combination was significant at 0.000, the second at 0.000 and the third significant at 0.001. The Table revealed that the first pair of linear combination between the three sets of data is quite high at 0.98. This decreased to 0.57 and 0.20 for the second and third sets of linear combination respectively. This shows that the first three pair linear combination share 98%, 57% and 20% of their variance respectively. Hence, there is a significant relationship between factor considered for the selection of contractors and critical success factors for project delivery. However, there is the need to find out the factors responsible for the significant relationship

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among the variates; this led to the use of the canonical structure matrix as shown in Table 11.

Table 10: Test for significance for canonical correlations variates

	Correlation	Eigen value	Wilks Statistic	F	Num D.F	Den0m D.F.	Sig.
1	.704	.981	.259	7.617	36.000	762.457	.000
2	.602	.570	.514	5.083	25.000	647.883	.000
3	.411	.203	.807	2.432	16.000	535.271	.001
4	.151	.023	.971	.580	9.000	428.488	.814
5	.074	.006	.994	.288	4.000	354.000	.886
6	.031	.001	.999	.172	1.000	178.000	.679

Taking 0.5 as the cut- off point, result in Table 11 shows that Technical Experience, Standard and Estimated cost Factor, and Managerial Knowledge in the linear combination structure above is an indication that there is a relationship between factors considered for the selection of contractors and critical success factor for project delivery. Taking the first column of the linear combination extracted, it was revealed that predicted Technical Experience of the first dataset which has a canonical loading of -0.676 was related to Standard and estimated cost Factor in the CSFs with a loading of -0.586. Managerial Knowledge does not have strong relationship with any of the factor in the second dataset. The third linear combination has no clear-cut pattern of linkage.

The result shows that Technical experience and Standard and Estimated Cost factor were the two major factors making the major contribution to the observed relationship between factor considered in the selection of contractors and critical success factors for project delivery. Under the technical experience; the technical capacity and experience correlating strongly with Standard and Estimated cost Factor which has Daily site, Performance related, Quality and Standard Related, and Realistic Estimated cost and Schedules in terms of Labour Rate.

This concludes that out of the six possible combinations of the factors, the relationship existing between them was found in three ways. Hence, there is a significant relationship between factors considered for the selection of contractors and critical success factors for project delivery in the study area. In seeking to find out the factors responsible for the significant relationship among the two independent set of factors, it was seen that Technical experience and Standard and Estimated Cost factor were the two major factors making the major contribution to the observed relationship between factor considered in the selection of contractors and critical success factors for project delivery. Under the Technical experience, the Technical capability and Experience is been captured to correlate strongly with Daily site factors, Performance related factors, Quality and Standard Related factors, and Realistic Estimated cost and Schedules in terms of Labour Rate which is captured under Standard and Estimated cost Factor.

Cheng and Choi (2004) and Fong and Choi (2004) in separate studies concluded that technical capability in terms of possession of specialist knowledge and deploying of adequate resources; overall experience, ability to work in new environment, labour recruitment process and rates significantly influences the selection process which are in consonance with this study. This study is also in consonance with Doloi (2009) that concluded that technical expertise, success in past projects, financial soundness and adequate organisational capacity have significant influence in the selection process. Hossenni *et al. (*2016) in another study explored the relationship between selection criteria and concluded that there exists inter relationship between the various selection criteria since one criterion may exert on the others.

Table 11: Canonical structure matrix for factors considered in selection of contractors and CSF for project delivery

X Factors	1	2	3
Personnel Reputation and Assurance	.027	.030	.028
Organisational Safety and Performance	.011	-.099	.093
Managerial Knowledge	.030	**.504**	-.153
Technical Experience	**-.676**	.036	.075
Project Management and Equipment	-.164	.116	-.128
Past Relationship With Client and others	-.097	-.289	-.338
Y Factors	1	2	3
Technical and Location Factor	-.251	.200	-.212
Planning and Procurement Factor	-.155	-.363	-.046
Standard and Estimated cost Factor	**-.586**	.124	.037
Contractor Resources and Risk Factor	-.207	-.115	.053
Project Management and Performance	-.068	-.384	-.167
External Factor	.131	.123	-.300

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CONCLUSION AND RECOMMENDATIONS

This study assessed the influence of contractor selection criteria on critical success factors of public project delivery in Abuja, Nigeria using cross-sectional questionnaire survey. Questionnaires were administered to Architects, Builders and Quantity Surveyors that were based in the study area. There exists significant relationships between the factors considered in the selection of contractors and the critical success factors for project delivery. In seeking to find out the factors responsible for the significant relationship between the two independent set of factors, it was seen that technical experience and standard and estimated cost factor were the two major factors making the major contribution to the observed relationship between factor considered in the selection of contractors and critical success factors for project delivery. Under the technical experience, the technical capability and experience is been captured to correlate strongly with daily site factors, performance related factors, quality and standard related factors, and realistic estimated cost and schedules in terms of labour rate which is captured under standard and estimated cost factor. Based on the relationship between selection criteria and success factors, there is the need to adopt the selection criteria for each individual project based on project characteristics, client characteristics and external environment for effective project delivery.

i. For effective public project delivery with respect to cost, time and quality, it is very important at the onset to carefully consider all criteria and factors for the selection of contractor as each project has its own attributes and peculiarities.
ii. There is need to pay more attention to the management capacity of contractors during the selection process for successful project delivery.
iii. It is necessary to make good assessment of the technical capacity and experience of the contractors when considering the cost factor for project delivery.
iv. It is worthy to note that the measure of resources and risks that contractors have cannot be assessed if there is a shallow knowledge of the managerial capacity during the selection process.
v. There is need to pay more attention to contractors past relationships with clients when an effective external stakeholders management is of utmost priority for project delivery.

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