RISK MANAGEMENT IN THE CONSTRUCTION INDUSTRY: ANALYSIS OF CRITICAL SUCCESS FACTORS (CSFs) OF CONSTRUCTION PROJECTS IN NIGERIA

FADUN, Olajide Solomon
Department of Actuarial Science and Insurance
Faculty of Management Sciences
University of Lagos, Akoka
sofadun@yahoo.co.uk

And

SAKA, Shafau Toyin
School of Management & Business Studies,
Lagos State Polytechnic, Ikorodu Lagos

Abstract

There are several risks associated with construction projects; hence, the need to manage construction projects risks effectively. Critical success factors (CSFs) are factors that influence the success and promote the achievement of a project objective. The concept of CSFs for construction projects has been widely researched in developed countries; but, with little research effort in developing countries including Nigeria. Thestudy examined CSFs of construction projects and theirapplication in the Nigerian construction industry. Survey research method with a structured questionnaire, focusing on 42 success factors, was used to collect data from participants. Exploratory factor analysis was carried out in three phases based on the study's research questions. The first phase of the analysis revealed that the concept of CSFs, project management tools and methodologies are observed to a reasonable extent by construction professionals in Nigeria. The second phase revealed eight categories of construction projects' CSFssimilar to those in literature in the Nigerian construction industry. The results of the last phase analysis suggested that the relevance of CSFs varies from one phase of construction projects to another. The implication for practice is that it is imperative for those involved in managing construction projects in Nigeria to identify and determine CSFs of all projects at the planning stage to ensure that necessary measures are adopted to monitor and manage the project, thereby enhancing overall success of the project.

Keywords*: Risk management, Critical success factors (CSFs), Construction industry, Nigeria.*

1. Introduction

Construction projects are completed through a series of processes, events, and interactions that take place during the lifecycle of the project in a dynamic environment. There are several risks associated with construction projects; and there are several factors that influence the success and promote the achievement of a project objectives. These factors are referred to as critical success factors (CSFs). If CSFs are well managed, they can enhance projects' success (Chan, Scott & Chan, 2004; Hwang & Lim, 2014; Kwikael & Globerson, 2006; Kog & Loh, 2012; Tabish & Jha, 2012).Nigeria is a developing country, and its construction industry is facing challenges associated with developing nations which include corruption, poor funding, and poor implementation of government policies and programmes (Carbaugh, 2017; Hess, 2016; O'Sullivan & Sheffrin, 2003). The era of formal construction operation in Nigeria started in 1940s with expatriate construction companies being dominant in the industry (Olowo-Okere, 1985). Expatriate construction companies completely dominated the sector because of the low level of human resource development and poor expertise of the indigenous construction companies, which disqualified them from being awarded contracts conceived by the government. Subsequently, the industry has witnessed progressive growth because of growing need for infrastructural development, activities in the solid minerals and oil and gas sector, growth and expansion of government activities (Oyewobi, Ganiyu, Oke, Ola-awo, & Shittu, 2011). Presently, the wide gap between the expatriate and indigenous construction companies has reduced significantly because of improved training institutions, collaboration between expatriate and indigenous construction companies, political stability, improved government policies (the Local Content Policy), and engagement of expatriates (Mbamali & Okotie, 2012; Olawale, Ibraheem & Salimonu, 2011). Moreover, indigenous construction companies stand better chance of winning government contracts due to Government (federal, state and local) policy on the Local Content Policy (Adedeji, Sidique, Rahman & Law, 2016; Bakare, 2011; Balogua, 2012; Ihua, Olabowale, Eloji & Ajayi, 2011; Monday, 2015; Ovadia, 2013; Stephen, 2011).The emergence of Private Partnership Projects (PPPs) has also improved capital investment in the industry; thus, promoting sustainable development of the industry.

The Nigerian construction industry contributed 3.12% of the nations' GDP in 2014 (Nigeria Bureau of Statistics, 2014).However, an assessment of the industry from the dimension of failed projects from1979 to 1998 showed that over four hundred and fifty billion naira was lost to failed projects in the public sector (Anyanwu, 2013). In this regard, Oyewobi et al. (2011) emphasised that the trend of unethical performance in Nigerian construction industry has led to loss of resources and underdevelopment of the nation's infrastructure. Hence, it is necessary to effectively manage construction projects' risks in Nigeria to enhance the Nigerian construction industry contribution to the nations' GDP.

The study examinescritical success factors (CSFs) of construction projects and their application in the Nigerian construction industry. Objectives of the study are to:

i. Explore the application of the concept of CSFs, project management tools and methodologies in construction projects in Nigeria.

ii. Identify and categorise CSFs for construction projects,and consider phases of projects in which these factors are critical or paramount.

2. Literature Review

2.1 Conceptual Clarification: Critical Success Factors (CSFs)

Critical success factors (CSFs) are factors that influence the success and promote the achievement of a project objectives. The concept of CSFs for construction project is not common in the context of the Nigeria construction industry. CSFs of a project are a concept that has been widely researched in the literature because of its relevance to a business organisation. CSFs generally connoteareas or aspectsthat impact positively on the achievement of project objectives (Dalcher, 2012; Flyvbjerg, Bruzelius & Rothengatter, 2003; Morris, 2013a; Van Marrewijk, Clegg, Pitsis & Veenswijk, 2008; Westerveld, 2003).Ika (2009) asserted that CSFs of a project consist of events, conditions, and circumstances surrounding the project that could contribute to its success. They are constraints which the project is exposed to and if appropriately managed, could result in project success. A good understanding of CSFs of projects would enable project managers and their teams to effectivelymanage projects' resources. Meanwhile, there are different dimensions of CSFs in the literature, which include: CSFs for information technology projects; CSFs for software projects; and CSFs for construction projects.The aspect of CSFs for construction projects is relevant to the study because the study examined critical success factors (CSFs) of construction projects in the Nigerian construction industry. The study seeks to establish the CSFs for construction projects from the perspective of the professionals based on diverse components of a construction project. CSFs of construction projects are discussed in the next subsection.

2.2 CSFs of Construction Projects

Several studies have been carried out on factors that influence success of projects (Cleland & King, 1983; Baker, Murphy & Fisher, 1983; Morris & Hough, 1987; Pinto & Slevin, 1989; Chua, Kog & Loh, 1999; Chan et al., 2004; Kog & Loh, 2012; Hwang & Lim, 2013). Zwikael and Globerson (2006) noted that the knowledge of CSFs is relevant in project management, and beneficial to projects managers and organisations involved in project activity. Moreover, the knowledge of CSFs can improve efficiency and effectiveness of a project management process. Avots (1969) examined reasons for project failure; and he established that three factors were responsible for project failures: wrong choice of project manager; unplanned termination of project; and unsupportive top management. Viewing project success factors from an organisation and project team characteristics perspective, Martin (1976)identified CSFs of a project as a clear goal, selection of organisational philosophy, general management support, organise and delegation of authority, and selection of project team. Rubin and Seeling (1967) examined the relationship between project success and project manager's experience. The study revealed that project manager's experience has no effect on project performance; but, the size of projects previously handled positively influences project manager's performance (Rubin and Seeling, 1967). Taking a wider view on various aspects of CSFs, Baker et al. (1983) developed a list of ten CSFs which are: (1) clear goal; (2) goal commitment of project team; (3) on-site project manager; (4) adequate funding to completion; (5) adequate project team capability; (6) adequate initial cost estimate; (7) minimum start-up difficulties; (8) planning and control techniques; (9) task-social orientation; and (10) absence of bureaucracy. Morris and Hughes (1987)also explored the impact of external environmental factors on project success; and they came up with a list of CSFs, including: project objectives; technical innovation uncertainty; politics; community involvement; schedule duration; urgency; financial contract; legal problems; and implementation problems. However, Morris and Hughes (1987) list of CSFs did not cover or consider characteristics of the project team.

Pinto and Slevin (1987) study focused on CSFs over the life cycle of a project and their relative importance. In the process, they identified ten (10) CSFs across projects life cycle: (1) project mission; (2) top management support; (3) project schedule/plan; (4) client consultation; (5) personnel; (6) technical tasks; (7) client acceptance; (8) monitoring and feedback; (9) communication; and (10) troubleshooting. Schultz, Slevin and Pinto (1987) study classified CSFs into two categories: strategic (including, top management support and project scheduling); and tactical (including, client consultation and personnel selection and training). A similar study was undertaken by Pinto and Prescott (1988) to analyse relative importance of CSFs based on Schultz et al. (1987) strategic and tactical CSFs classification.Their findings indicated that the importance of CSFs varies differently across phases of a project, depending on the performance criteria applied (Pinto & Prescott, 1988). This suggests that the relative importance of CSFs is subject to change at distinct phases of a project life cycle. Tukel and Rom (2001) viewed CSFs of a project in relation to organisation, client and role of project managerin executing the project. In the process, they identified five CSFs which are: top management support; client consultation; preliminary estimates; availability of resources; and project manager's performance. Interestingly, the last two sets of CSFs (i.e., availability of resources; and project manager's performance) agree with CSFs identified by Walid and Oya (1996) who identified four project CSFs, namely: project manager; team members; organisation; and external environment. Similarly, Ashley, Lurie & Jaselskis (1987) study revealed that organisational planning effort, project manager goal and commitment, project team motivation, project manager technical capabilities, scope and work definition, control systems, and safety are projects CSFs. Since previous studies identified project manager involvement as a CSF; hence, it is reasonable to state that CSFs of projects revolve around project managers and organisations involved in project management.

CSFs can also be referred to as 'delay factors'. In the context of construction projects, delay factorsare situations or circumstances which can prolong the timeframe of a project's successful completion (Al-Momani, 2000; Chan & Kumaraswamy, 1997; Kaming, Olomaiyr, Harris & Holt, 1997; Shahu, Pundir & Ganapathy, 2012; Williams, Klakegg, Walker, Andersen & Magnussen, 2012). Existence of delay factors in a project may result to project time overrun, cost overrun, litigation, disputes, arbitration and total abandonment (Chan & Kumaraswamy, 2002; Gunduz, Nielsen & Ozdemir, 2013; Winch, 2013). According to Kasmu & Usman (2013), the biggest problems confronting the Nigerian construction industry include cost overrun, loss of productivity and revenue, and eventual termination of projects is delay. Assaf and Al-Hajji (2004) identified 71 delay factors; and these factors were categorised into nine groups of project-related factors, which include: owner-related factors; contractor-related factors; consultant-related factors; design team-related factors; materials-related factors; equipment-related factors; labour-related factors; and external factors. The implication is that there are sets of delay factors associated with different aspects of construction projects.

2.3 Identification of CSFs Used for the Study

The above discussion (Section 2.2) showed that several CSFs have been identified in the literature. Consequently, it is essential to identify CSFs used for the study. The list and category of 42 success factors used for the study is developed based on previous studies, as discussed in Section 2.2 above. The list and category of success factors used for the study is presented in Table 1.

Table 1: List and category of success factors used for the study

S/N	CATEGORY	SUCCESS FACTORS	PREVIOUS STUDIES
1	Project characteristics	Political risks	Morris &Hough (1987);Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
2		Economic risks	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
3		Adequacy of funding	Martin (1976); Cleland&King (1983); Chua, Kog & Loh (1999); Hwang& Lim (2013); Kog & Loh (2012)
4		Constructability	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
5		Project size	Ashley, Lurie & Jaselskis (1987)
6		Complexity of project	Chan, Scott & Chan (2004)
7	Contractual arrangements Project Participants	Formal dispute resolution process	Chua, Kog & Loh (1999); Kog & Loh (2012)
8		Realistic obligations/clear objectives and scope	Martin (1976); Baker, Murphy &Fisher (1983); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
9		Risk identification and allocation	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
10		Adequacy of plans and specifications	Sayles &Chandler (1971); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
11		Safety	Ashley, Lurie & Jaselskis (1987); Chua, Kog & Loh (1997)

12		Technical uncertainty	Chua, Kog & Loh (1997); Hwang & Lim (2013)
13		Contractual Motivation/incentives	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
14		Project manager's competency and authority	Sayles&Chandler (1971); Walid &Oya (1996); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
15		Project manager's commitment to established schedules and budget	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
16		Nature of project manager's authority	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
17		Project team motivation.	Ashley, Lurie & Jaselskis (1987)
18		Project leader's working relationship with others	Chan, Scott & Chan (2004)
19		The nature of the client	Chan, Scott & Chan (2004)
20		Support and provision of resources	Chan, Scott & Chan (2004)
21		Client's contribution to design	Chan, Scott & Chan (2004)
22		Owner involvement and frequent feedback	Sayles &Chandler (1971); Pinto &Slevin (1989); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
23		Owner commitment to established schedules and budget	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
24		Owner satisfaction with delivered project	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
25		Capability of contractor key person	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
26		Contractor's commitment to established schedules and budget	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
27		Contractor's team capability and commitment	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
28		Capability of consultant key person	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
29		Consultant's commitment to established schedules and budget	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
30		Consultant's team capability and commitment	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)

31	Interactive processes	Frequent feedback from parent organisation	Pinto &Slevin7(1989);Sayles &Chandler (1971); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
32		Monitoring and feedback on project	Sayles & Chandler26(1971); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
33		Communication throughout project duration	Pinto&Slevin (1989); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
34		Adequate planning and control techniques	Martin (1976); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
35		Sufficient working drawing details	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
36		Availability of backup strategies	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
37		Budget updates	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
38		Schedule updates	Sayles &Chandler (1971); Cleland & King (1983)
39		Design control meetings	Locke (1984); Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
40		Construction control meetings	Locke (1984);Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)
41		Procurement method	Chan (2004)
42		Site inspections	Chua, Kog & Loh (1999); Kog & Loh (2012); Hwang & Lim (2013)

Source: Developed by Researchers.

Table 1 contains 42 success factors used for the study, selected based on their ranking in the literature. The list was limited to 42 to reduce the time required by respondents to assign scores to each success factorbased on a Likert scale.

3. Methodology

Survey research method was adopted for the study. A structured questionnaire, focusing on 42 success factors, was developedand administered to respondents to collected primary data for the study. Structured questionnaire was used because it is suitable for rating of CSFs to determine their relevance and importance. However, the approach adopted deviated from approach used for previous studies which utilised a questionnaire that demanded a pair-wise comparison of the CSFs. The study focused on construction companies operating in Lagos, Port Harcourt, Onitsha and Abuja. One hundred and twenty

(120) construction professionals, including expatriates and indigenous professionals, through stratified random sampling technique were engaged for the study. Construction professionals engaged for the study include: architects, quantity surveyors, civil and structural engineers and mechanical and electrical engineers. 120copies of the research questionnairewere administered to participants through personal contact and collected within six months, February - July 2017.

The research questionnaire consists of three sections. Section one of the questionnaire was designed to collect respondents' information/data. The section two was designedto ascertain the level of knowledge and usage of the concept of CSFs by the professional in the construction industry. Likert scale 1 to 5was used for six structured questions in this section, where 1-5 represent strongly agree, agree, undecided, strongly disagree, and disagree respectively. This type of scale was adopted by Elhag and Boussabaine (1998), and Chan (2012) forsimilar studies.Section three of the questionnaire aimed at identifying CSFs for overall success of a construction project, and ascertain variation of CSFs across projects' phases. In section three of the questionnaire, respondents were asked to rate 42 success factors based on their likelihood to affect success of a construction project. In addition, respondents were asked to identify project phases (using 1,2,3,4,and 5 to represent initiation, planning, execution, monitoring/control, and closure phases respectively) in which success factors are critical. The data collected were analysed through exploratory factor analysis with SPSS. Exploratory factor analysis is ananalytical tool that can provide insight on interaction between many correlated, but apparently unrelated variables (Overall & Klett, 1972). It has been used by researchers from different disciplines to identify and interpret non-correlated group of variables (Fabrigar, Wegener, MacCallum & Strahan, 1999; Jung & Lee, 2011; Osborne & Fitzpatrick, 2012). Variables which are correlated with some commonalities and independent of other subset of variables were grouped as a factor. This is a suitable data analysis tool for the study because it facilitated grouping of variables or factors (identified 42 success factors) based on their relationship (Hair, Anderson, Tathum & Black, 1995).

4. Data Analysis and Discussions

4.1 Descriptive Data – Respondents' Data

A total of 78 valid responses, which represents seventy-eight percent (78%) response rate, was retrieved from the participants. Table 2 shows respondents' profession. A higher proportion of the respondents (48.7%) were Civil and Structural Engineers; and, the lowest proportion of the respondents were Architects (Table 2).

Table 2: Respondents'Profession

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Architect	8	10.3	10.3	10.3
	Quantity Surveyor	19	24.4	24.4	34.6
	Civil & Structural Engineer	38	48.7	48.7	83.3
	Mechanical & Electrical Engineer	13	16.7	16.7	100.0
	Total	78	100.0	100.0	

Source: Field survey, 2017

Table 3 shows respondents' experience. About 76% of the respondents have over 8-year professional experience (Table 3). This is beneficial as it implies that data collected for the study are provided by respondents with professional experience.

Table 3:Respondents'Experience

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<5years	11	14.1	14.1	14.1
	5 – 7 Years	8	10.3	10.3	24.4
	8 – 9 Years	15	19.2	19.2	43.6
	10 – 12 Years	17	21.8	21.8	65.4
	13 – 15 Years	22	28.2	28.2	93.6
	>15 Years	5	6.4	6.4	100.0
	Total	78	100.0	100.0	

Source: Field survey, 2017

Table 4 shows respondents' educational qualification. About 97% of the respondents were degree holders (Degree, Masters and Ph.D). This is beneficial as it enhances the possibility of having valid responses from respondents.

Table 4: Respondents' Educational Qualification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	2	2.6	2.6	2.6
	Degree	63	80.8	80.8	83.3
	Masters	12	15.4	15.4	98.7
	PhD	1	1.3	1.3	100.0
	Total	78	100.0	100.0	

Source: Field survey, 2017

4.2 Level of Knowledge, Application of CSFs and Project Management Tools

Table 5 shows analysis of responses to Section two questions. The essence of the section is to ascertain the level of the knowledge as well as the application of the concept of CSFs and project management tools for construction projects in Nigeria.

Table 5: Level of Knowledge, Application of CSFs and Project Management Tools

	Knowledge of the concept of CSFs.	Observance of CSF in projects work.	Significance of CSFs in relation to project success.	Companies view onrelevancy of CSFs for project success.	Success of construction projects due to observation of CSFs	Use of project management tools and techniques in project operations.
N Valid	78	78	78	78	78	78
Missing	0	0	0	0	0	0
Mean	2.05	2.13	1.96	1.85	1.86	1.91
Median	2.00	2.00	2.00	2.00	2.00	2.00
Mode	2	2	2	1	2	2
Std. Deviation	1.150	1.199	1.133	.981	.977	1.083
Variance	1.322	1.438	1.284	.963	.954	1.174

Source: Field survey, 2017

Table 5 shows that the mean, median and mode can be approximated to 2, which implies that the sampled population has an average knowledge and understanding of the concept and usage of project management tools in respondents' professional works. The result also suggests that majority of the respondents upheld the relevance of the concept of CSFs to the success of construction projects.

4.3 Exploratory Factor Analysis

Exploratory factor analysis was undertaken in four stages: tests, extraction, rotation, and interpretation.This analysis is presented below.

4.3.1 Tests

To establish that the dataset is suitable for factor analysis, Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) test were carried out. Bartlett's test of sphericity measured the multivariate normality of variables and confirms that the correlation matrix is an identity matrix; and, KMO test measures the sampling adequacy (Hair et al., 1995; Kaiser, 1960; Tabachnick & Fidell, 2007). Table 6 shows the results of KMO and Bartlett test/analysis.

Table 6: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.721
Bartlett's Test of Sphericity	Approx. Chi-Square	2013.456
	df	861
	Sig.	.000

Source: Researchers' Analysis

The value of the KMO test was 0.721. This value (0.721) exceeds the least acceptable level of 0.5; thus, indicates that the distribution of values in the matrix is adequate for factor analysis (Hair et al., 1995; Kaiser, 1960; Tabachnick & Fidell, 2007). The result of the Bartlett's test of sphericity also shows that it is significant at 0.000. Consequently, the result of KMO and Bartlett's test indicated that factor analysis is suitable for analysing data collected for the study.

4.3.2 Extraction of Components

Principal component analysis recommended for establishing preliminary result in factor analysis (Pett, Lackey & Sullivan, 2005) was used to develop a simple structure to minimise the possibility of having a general component in the solution (Gorsuch, 1983). Component extraction is the process of determining the number of variables that explainsan underlying co-variation matrix within a dataset. In this study, three main criteria (Eigenvalues, Cumulative Percentage Variance, and Scree Test) used for this purpose are presented below:

4.3.2.1 Eigenvalues

Kaiser's eigenvalue criterion specifies that factors with greater than 1eigenvalues are retained for interpretation (Fabrigar et al., 1999), was applied. Eigenvalues is simple and easy to understand; and itserves as a default value for many statistical programmes including SPSS. An eigenvalue is the sum of the squared factor loadings for a given factor which indicates how much variance in the observed indicators is being explained by a latent factor (Fabrigar et al., 1999).However, this method has been widely criticised as having the tendency to over simplify the result and over estimate the number of factors to be retained, resulting to arbitrary selection of factors (Zwick & Velicer, 1986). In this regard, one can ask the question that is it right to select a factor with an eigenvalue of 1.02 and reject the one with a value of 0.998? This limitation of decision based on eigenvalues greater than 1 was overcome by using the cumulative percentage variance and scree test (see Sections 4.3.2.2 and 4.3.2.3 below).

4.3.2.2 Cumulative Percentage Variance

This is the sum of the percentage variance for each of the extracted variables.Table 7 shows total variance explained. Overall, 12 components were extracted with a cumulative percent value of 64.074%. This implies that the 12 components accounted for 64.074%of the variance. This is a substantial value given that the recommended values for factor analysis is >50% (Kaise, Olomaiyr, Harris & Holt, 1974). When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Table 7: Total Variance Explained

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	11.100	26.430	26.430	10.800	25.713	25.713	8.592
2	3.706	8.824	35.254	3.351	7.978	33.691	6.739
3	2.736	6.514	41.768	2.401	5.716	39.407	6.840
4	2.178	5.187	46.955	1.886	4.489	43.897	2.448
5	1.754	4.175	51.130	1.439	3.427	47.323	2.114
6	1.623	3.863	54.993	1.330	3.167	50.490	5.141
7	1.567	3.731	58.724	1.197	2.850	53.341	2.366
8	1.548	3.687	62.411	1.099	2.616	55.957	1.486
9	1.375	3.274	65.684	.994	2.368	58.324	1.260
10	1.340	3.191	68.875	.942	2.243	60.567	1.669
11	1.161	2.765	71.640	.826	1.967	62.534	1.265
12	1.071	2.549	74.189	.647	1.540	64.074	3.302
13	.935	2.225	76.414				
14	.906	2.157	78.571				
15	.799	1.901	80.473				
16	.735	1.750	82.223				
17	.662	1.575	83.798				
18	.643	1.530	85.329				
19	.594	1.415	86.744				
20	.562	1.338	88.081				
21	.535	1.273	89.354				
22	.473	1.127	90.481				
23	.445	1.059	91.540				
24	.407	.969	92.510				
25	.365	.870	93.380				
26	.343	.816	94.195				
27	.312	.742	94.938				
28	.274	.652	95.590				
29	.261	.621	96.211				
30	.248	.591	96.802				
31	.203	.483	97.284				
32	.195	.463	97.748				
33	.173	.412	98.160				
34	.144	.342	98.502				
35	.118	.280	98.782				

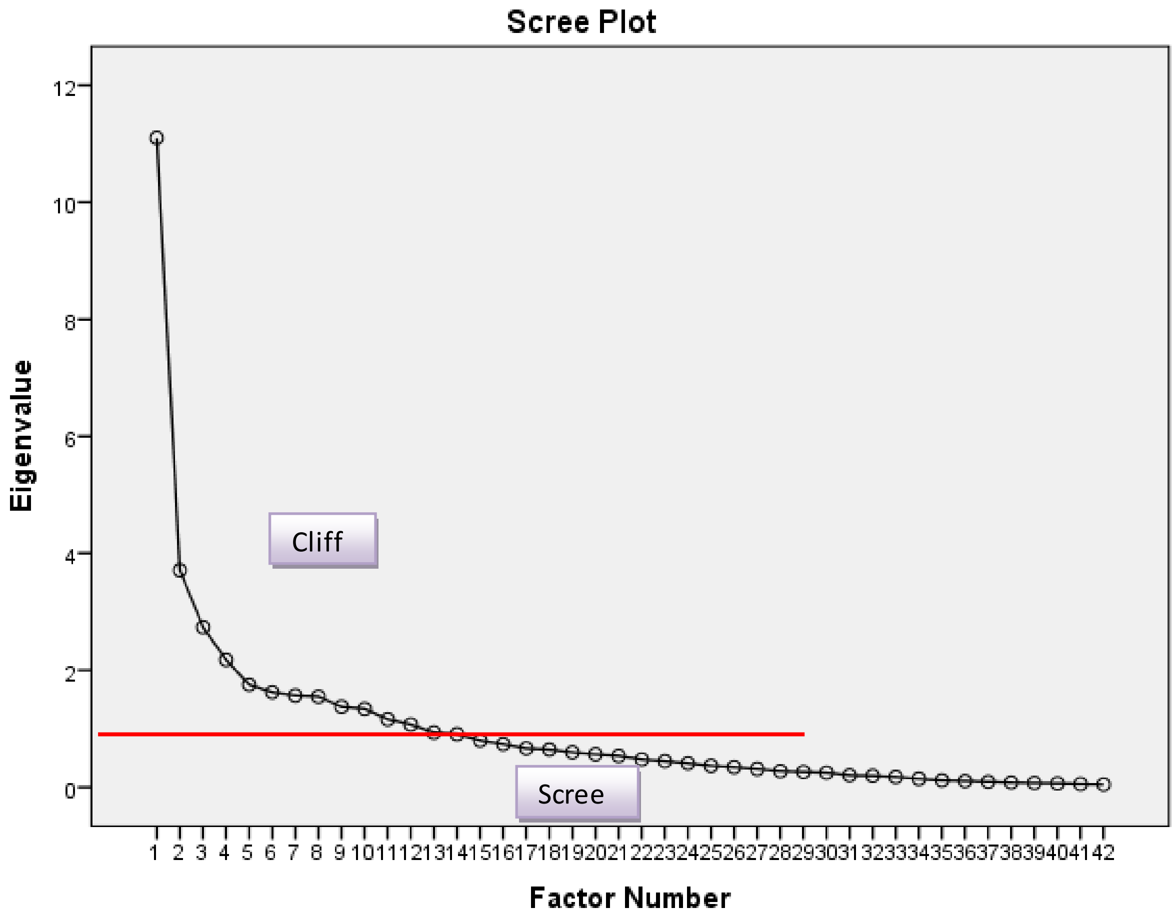
36	.106	.252	99.034				
37	.092	.220	99.254				
38	.079	.188	99.441				
39	.072	.171	99.612				
40	.064	.152	99.765				
41	.053	.127	99.892				
42	.045	.108	100.000				

Extraction Method: Principal Axis Factoring.
Source: Researchers' Analysis

4.3.2.3 Scree Test

Cattell's (1966) scree test is another method used to determine the number of factors to be retained. This is a highly subjective test that requires researchers' judgement in terms of factors to be retained (Gorsuch, 1983; Tabachnick & Fidell, 2007; Thompson, 2004). Figure 1 shows a scree plot which displays total variance associated with each variable. The slope shows large factors, while the gradual trailing (Scree) shows factors with eigenvalues lower than 1. The main assumption behind the scree test is that a few major factors may account for most of the variance resulting in a 'cliff', followed by a 'scree'. This tends to produce a more accurate result than the Kaiser's eigenvalue-greater-than 1 rule (Zwick & Velicer, 1986).

Figure 1: Scree Plot



4.4 Rotation

Rotation is a method suitable for creation of variables structure to ensure easy interpretation of data. It also maximises factor loadings of items that best measure their respective factor and specifies the nature of relationship between affected factors. Factors can be said to be correlated (in which case oblique rotation would be appropriate) or uncorrelated (in which case orthogonal rotation would be more appropriate) (Fabrigar et al., 1999). Promax rotation (an oblique rotation method) was used for rotation of variables and the correlation matrix is shown in Table 8. The correlation matrix shows that the highest value of correlation exists between factor 1 (interactive processes) and factor 3 (project manager). This is expected as factor 1 reflects range of a project manager'sactivity, and factor 3 reflects project manager's personality and qualities.

Table 8: Factor Correlation Matrix

Factor	1	2	3	4	5	6	7	8	9	10	11	12
1	1.000	.496	.581	-.023	-.012	.455	.173	-.068	.041	.018	.162	-.588
2	.496	1.000	.476	.099	.257	.361	.058	-.026	.111	.035	.042	-.363
3	.581	.476	1.000	.120	.156	.301	.158	-.340	.124	.013	.095	-.427
4	-.023	.099	.120	1.000	.157	.008	-.130	-.260	.110	.099	.260	-.006
5	-.012	.257	.156	.157	1.000	-.034	-.009	-.081	-.115	-.160	-.008	.068
6	.455	.361	.301	.008	-.034	1.000	.332	.119	-.248	.423	-.024	-.348
7	.173	.058	.158	-.130	-.009	.332	1.000	.213	-.120	.375	-.140	.005
8	-.068	-.026	-.340	-.260	-.081	.119	.213	1.000	-.168	.207	-.240	.198
9	.041	.111	.124	.110	-.115	-.248	-.120	-.168	1.000	-.106	-.112	.039
10	.018	.035	.013	.099	-.160	.423	.375	.207	-.106	1.000	-.231	.056
11	.162	.042	.095	.260	-.008	-.024	-.140	-.240	-.112	-.231	1.000	-.188
12	-.588	-.363	-.427	-.006	.068	-.348	.005	.198	.039	.056	-.188	1.000

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

Source: Researchers' Analysis

4.4.1 Pattern Matrix

Pattern Matrix shows factor loadings for results obtained from the rotation (Table 8) undertaken to ensure an interpretable structure. Pattern matrix also shows the number of variables for each factor and their loadings. Table 9 shows the study's pattern matrix. The Cronbach's Alpha value (that measure the reliability of the factors) for each of the factors was calculated with 0.5 being used as the least value acceptable. Factors 9-12 were rejected because they all have a single variable loading. There was no cross-loading of the variables after suppressing the variables with loadings values less than 0.4. Ten of the variables considered did not add load to any of the 12 factors.

Table 9:Pattern Matrix[a]

	Factor											
	1	2	3	4	5	6	7	8	9	10	11	12
	Interactive Processes	Human-related Factors	Project Manager	Risk	Project characteristics	Control Processes	Project Owner	Project Plan				
Cronbach's Alpha	.866	.845	712	.751	.701	.709	.513	793	-	-	-	-
Variables												
Schedule updates	1.004											
Budget updates	.954											
Project team motivation	.831											
Construction control meetings	.744											
Procurement method	.735											
Design control meetings	.661											
Site Inspection												
Consultant team capability and commitment												
Nature of project manager's authority)												
Formal dispute resolution process												
Owner involvement and frequent feedback		.896										
Contractor team capability and commitment		.812										
Availability of backup strategies		.802										
Communication throughout project duration		.598										
Contractor commitment to established schedules and budget		.517										

Project manager commitment to established schedules and budget			1.1 35									
Project manager competency and authority			.88 5									
Adequacy of plans and specifications			.78 0									
Project leader’s working relationship with others			.48 3									
Contractual Motivation/incentives												
Support and provision of resources												
Political risks				.854								
Economic risks				.841								
Risk identification and allocation				.581								
Project Size					.791							
The nature of the client					.625							
Complexity of project					.560							
Capability of consultant key person						.941						
Technical uncertainty						.705						
Frequent feedback from parent organisation						.590						
Owner satisfaction with delivered project							.692					
Owner commitment to established schedules and budget							.584					
Adequate planning and control techniques								.820				
Sufficient working drawing details								.571				
Capability of contractor key person									.655			
Adequacy of funding												
Client’s contribution to design										.721		

Constructability												
Safety											.719	
Consultant ommitment to established schedules and budget												
Realistic obligations/clear objectives and scope												.794
Monitoring and feedback on project												

Source: researchers' Analysis

4.5 Interpretation of Factors

A minimum loading value of 0.40 was used to select salient variables for each factor; and the variables were loaded for extracted factors (Gorsuch, 1983). Table 9 shows that only two variables have a loading value less than 0.5, which implies that they contributed significantly to their factor groups or categories.To determine the reliability of each factor, Cronbach's Alpha Value was calculated for each of them; and only factors with value greater than 0.5 (factors 1-8) were significant. This is because two or more variables must load on a factor for it to be considered (Henson & Roberts, 2006; Isaac & Michael, 1997). The label name for each of the factors was selected by considering the correlation that exists between factors, and assigning a name that appropriately defines it. Labelling of factors is a deductive, theoretical and subjective process (Pett et al., 2005).

As shown in Table 1 above, the 42 success factors (variables) used for the study are categorised into 8 namely: interactive processes; human-related factors; project manager; risks; project characteristics; control processes; project owners; and project plan. Table 10 shows cumulative percentage with Cronbach alpha value and Eigenvalue of categories of success factors. The results of the 8 categories of CSFs are discussed below.

Table 10: Cumulative, Cronbach alpha value and Eigenvalue of CSFs Categories

S/N	Categorisation of Identified CSFs	Cumulative (%)	Cronbach's Alpha Value	Eigenvalue
1	Interactive Processes	25.713	0.866	11.100
2	Human-related Factors	33.691	0.845	3.706
3	Project Manager	39.407	0.712	2.736
4	Risks	43.897	0.751	2.178
5	Project Characteristics	47.323	0.701	1.754
6	Control Processes	50.490	0.709	1.623
7	Project Owner	53.341	0.513	1.567
8	Project Plan	55.957	0.793	1.548

Source: Researchers' Analysis

Category 1Factors: Interactive Processes

The total percentage of variance of success factors in this category is 25.713%, with a total eigenvalue of 11.10. Its reliability test yielded a Cronbach's Alpha value of 0.866 which is highly significant and the highest when compared with the other factors. The variables categorised under this factor include: schedule updates, budget updates, project team motivation, construction control meetings, procurement method, and design control meetings. Schedule update had the highest level of criticality with a loading value of 1.004, while design control meeting has the least with a loading value of 0.661 (see Table 9). Variables that load under this factor are spread across basic objectives of a construction which include schedule, budget and quality performances. Hence, schedule updating is relevant for schedule performance (time savings); budget updates and procurement method ensure budget performance (cost savings); and construction and design control meetings to ensure good budgeting and quality performances of the project. In addition, the result shows the importance of construction control meeting (with a loading value of 0.744) over design control meeting (with a loading value of 0.661), thereby emphasising the former over the latter in construction projects. This result agrees with Chua et al. (1999) study in which budget update, schedule update, site inspection, construction control meetings, and design control meetings were grouped under the same factor (Interactive processes – Factor category). The result also affirms that construction projects consist of predefined and dynamic activities which may change from one phase to another (Chua et al., 1999). This underpins the selection of schedule update, budget update, construction control meetings and design control meetings as CSFs for construction projects.Hence, relative importance of CSFs vary across the life cycle of a construction project (Pinto &Prescott, 1988). For instance, the relative importance of design control meetings decreases from the planning phase to monitoring and control phases; but, that of construction control meeting increases (Hodgson & Cicmil, 2006; Miller & Lessard, 2000).

Category 2 Factors: Human-related Factors

Success factors in this category have a total percentage variance of 7.978%, with an eigenvalue of 3.706. The Cronbach's Alpha value is also highly significant at 0.845 which upholds its reliability. Variables loaded in this category include owner involvement and frequent feedback, contractor team capability and commitment, availability of backup strategies, communication throughout project duration, and contractor commitment to establish schedules and budget. Owner involvement and frequent feedback had the highest level of criticality with a loading value of 0.812, while contractor commitment to establish schedule and budget had the least with a loading value of 0.512. Variables loaded in this category tend to focus on the human-related variables which influence success of construction projects. This according to Yong and Mustaffa (2013), human-related variables include trust, commitment and effective communication issues among stakeholders of a construction project. Generally, human-related factors consist of intangible variables (including behaviour and mind-set) which are subjective and difficult to measure. This implies that human-related factors constitute construction projects critical success factors. It is, therefore, imperative to establish measuresat the initial stage of a project to enhance trust, effective communication, feedback, and stakeholders' commitment throughout the lifecycle of the project. The implication for practice is that competence of a project team member is critical throughout the lifecycle of a construction project (Morris, 2013b; Puthamont & Chareonngam, 2007; Rashvand & Majid, 2014).

Category 3 Factors: Project Manager

Factors in this category have5.716%variance value, with an eigenvalue of 2.736. The value of Cronbach's Alpha test of reliability has a significant value of 0.712. The three variables in this category are: project manager's commitment to establish schedules and budget, project manager's competency and authority, adequacy of plans and specifications, and project leader's working relationship with others are variables which were loaded in this category. The first and most critical variable or factor in this category is 'project manager's commitment to established schedules and budget', which also emerged as the most important overall factor that influences project success. A project manager's competency and performance can be influenced by his/her ability to delegate authority, coordinate, negotiate and make good decision (Hwang & Lim, 2013; Yong & Mustaffa, 2013). The other two variables in this category (i.e. 'adequacy of plans and specifications' and 'project leader's working relationship with others') also revolve around the competency of the project manager. Project manager'scompetence is essential, particularly during the planning and closure phase of a project (Flyvbjerg, Garbuio & Lovallo, 2009; Soderlund, 2011; Zwikael & Globerson, 2006). This implies that it is essential that project and construction managers should possess requisite technical and administrative skills to enhance their performance (Isa, Jimoh & Achuenu, 2013; Morris & Geraldi, 2011; Pinto & Slevin, 1989). Consequently, project managers' competency is a critical factor throughout the lifecycle of a project (Al-Tmeemy, Abdul-Rahman & Harun, 2011; Puthamont & Chareonngam, 2007).

Category 4 Factors: Risks

Success factors in this category (risk-related factors) have 4.489% variance value, with an eigenvalue of 2.178. The category Cronbach's Alpha test of reliability value is significant at 0.751. Variables loadedin this category include political risks, economic risks, and risk identification and allocation. The loading values for political and economic risks are 0.854 and 0.841 respectively; which suggestthat both have approximately the same level of impact on the success of construction projects. Political and economic risks are external environmental factors that can enhance the success of construction projects (Morris, Pinto & Soderlund, 2011; Orr, Scott, Levitt, Artto & Kujala, 2011). This result was expected given the political and economic instability associated with the Nigeria political and economic systems. These factors are critical at the planning phase (risk identification and allocation); moreover, political risk and economic risk can influence a project throughout its lifecycle. If properly managed, external environmental factors of a construction project can impact the project's success and performance (Thi & Swierczek, 2010; Uher & Loosemore, 2004). Since external environmental factors are beyond the control of the construction industry; it is necessary to include appropriate terms and conditions in projects contractual agreement to checkmate negative impact of political, economic and environmental factors on construction projects (Cao & Hoffman, 2011; Iboh, Adindu & Oyoh, 2013).

Category 5 Factors: Project Characteristics

Success factors in this category have 3.427% variance value, with eigenvalue of 1.754. The reliability test result yielded a Cronbach's Alpha value of 0.701, which is significant. Variables in this category include: project size, nature of the client, and complexity of project. Many large projects usually fail to meet completion deadline (Tukel &Rom, 2001; Van Marrewijk, Clegg, Pitsis & Veenswijk, 2008; Williams, Samset & Sunnevag, 2009). In most cases, this may arise due to increase in the number of project activities, project schedule and allocation of resources. Project complexity may be associated with a peculiar nature of a project which may impact significantly on performance of the project manager and success of the project (Thi & Swierczek, 2010). Generally, complex construction projects require vast technical skills, expertise and brainstorming.A project manager's previous experience in handling complex projects can impact on success of subsequent projects handled by the manager (Rubin & Seeling, 1967; Shahu, Pundir & Ganapathy, 2012). Hence, project managers' ability to handle complex projects should be considered when assigning project managers to projects.

Category 6 Factors: Control Processes

Success factors in this category have1.623% variance value, with an eigenvalue of 1.623. The Cronbach's Alpha test of reliability has a significant value of 0.709. Variables in this category are: capability of consultant key person, technical uncertainty, and frequent feedback from parent organisation. The first two variables in this category (i.e., capability of consultant key person and technical uncertainty) can be viewed as uncertainty-related variables. Uncertainty occurs when the probability distribution of an event is not known (lack of knowledge about the possible outcomes); but, a project risk is an uncertainty with a defined probability distribution with the precise outcome unknown beforehand (Chapman & Ward, 2002; Ericson & Doyle, 2004; Hillson, 2004). Capability of consultant, key persons and technical uncertainties are project risk-related variables because their possible outcomes or probability distribution are known; but, their precise outcomes, which are critical to project success are not known (Isik, Arditi, Dikmen & Birgonul, 2009; Kog & Loh, 2012; Shahu, Pundir & Ganapathy, 2012). Regular feedback from top management of principal organisations is key to success of construction projects. This shows that top management support by way of effective communicationand feedback from key stakeholders is essential to ensure success of construction projects (Ika, Diallo & Thuillier, 2012; Tukel & Rom, 2001; Zwikael & Globerson, 2006).

Category 7 Factors: Project Owner

Success factors in this category have a percentage of variance value of 2,850 and an eigenvalue of 1.567. The Cronbach's Alpha test of reliability indicated the lowest significant value of 0.513. The two variables that were loaded in this category are 'owner satisfaction with delivered project' and 'owner commitment to established schedules and budget'. The loading value for owner satisfaction with delivered project is higher than that of their commitment to establish schedules and budget. This implies that notwithstanding their commitment or involvement in the project, project owners would expect maximum satisfaction and success of their projects. 'Involvement of owner', 'frequent communication and feedback', and 'enthusiasm'can enhance owners' satisfaction in terms of project delivery (Hwang & Lim, 2013). Project owners can assess project delivery based on cost, time and quality (Jugdev & Muller, 2005; Khang & Moe, 2008; Hwang & Lim, 2013). It is expected that project owners would desire the best quality within a reasonable timeframe at the lowest cost possible.

Category 8 Factors: Project Plan

Success factors in this category have 2.616% variance value, with an eigenvalue of 1.548. The Cronbach's Alpha test of reliability has a significant value of 0.793 with two loading variables: 'adequate planning and control techniques' and 'sufficient working drawing details'. Adequacy of plans and specifications depends on development of a project plan, based on the principal's (project owner) need or requirement, by a project consultant. In this regard, Hwang and Lim (2013) showed that there is need for a project owner, project consultant, and project contractor to develop workable project plans and specification before commencement of a project. Puthamont and Chareonngam, (2007: 181) also noted that 'adequate planning and control techniques' and 'sufficient working drawing details' are critical throughout the lifecycle of a project. Consultation with key project stakeholders at a project planning stage is essential and critical to successful completion of construction projects (Hwang & Lim, 2013; Rashvand & Majid, 2014; Zwikael & Globerson, 2006). Meredith and Mantel (2003) identified a six-planning sequence for projects consisting of: preliminary coordination; detailed description of tasks; adhering to project budget; adhering to project schedule; precise description of all status reports; and planning the project termination. A seven phase planning processes was recommended by Russell and Taylor (2003). This include defining project objectives; identifying activities; establishing precedence relationships; making time estimates; determining project completion time; comparing project schedule objectives; and determining resource requirements to meet objectives (Russell & Taylor, 2003). The quality of project planning can be enhanced by applying appropriate tools and methods contained in Project Management Body of Knowledge (PMBOK) Guide (Project Management Institute, 2013).

5. Conclusion, Implications and Recommendations

5.1 Conclusion

The study has examined critical success factors (CSFs) of construction projects and their application in the Nigerian construction industry. The study explored the application of the concept of CSFs, project management tools and methodologies in construction projects in Nigeria. It also identified and categorised construction projects CSFs, and considered phases of projects these factors are critical or paramount. The study revealed that there is a significant improvement in terms of understanding and application of the concept of CSFs and project management tools by the professionals in the Nigeria construction industry. Numerous CSFs for construction projects and classifications were identified in the literature, but this study focused on 42 CSFs (variables). This is to ensure a well-focused investigation and reduction of the time required for completion of the research questionnaire by participants. Moreover, it is practically impossible to use all CSFs identified in the literature as variables. CSFs were based on budget, schedule and quality performances and their grouping or classification were different (contractual arrangement, interactive processes, project participants, and project characteristics). The study contributed to knowledge on CSFs of construction projects by identifying eight categories of CSFs: interactive processes, human-related, project manager, risks, project owner, project characteristics, control processes, and project plan. Generally, the results indicated that the knowledge and application of the concept of CSFsby construction professionals is critical to success of construction projects.

5.2 Implications of Findings for Practice

The results suggested that the relevance of CSFs varies from one phase of construction projects to another. The implication for practice is that it is imperative for those involved in managing construction projects in Nigeria to identify and determine CSFs of each project at the planning stage to adopt necessary measures to monitor and manage the project, thereby ensuring overall success of the project.Considering the importance of human-related factors in construction projects, it is imperative to establish measures at the initial stage of a project to enhance trust, effective communication, feedback, and stakeholders' commitment throughout the lifecycle of the project. The implication for practice is that competence of a project team member is critical throughout the lifecycle of a construction project. External environmental factors (including political and economic risks) of a construction project can impact the project's success and performance. External environmental factors are beyond the control of the construction industry. The implication for practice is that it is beneficial to include appropriate terms and conditions in projects' contractual agreement to checkmate negative impact of political, economic and environmental factors on construction projects.

CSFs can also be referred to as 'delay factors'. In the context of construction projects, delay factor are situations or circumstances which can prolong the timeframe of a project successful completion. The implicationis that there are sets of delay factors associated with different aspects of construction projects. The managerial implication of this is that top management support by way of effective communication and feedback from key stakeholders is essential to ensure success of construction projects.Project manager's competence is essential throughout the lifecycle of a project. Project managers' competency is a critical factor throughout the lifecycle of a project. Hence, it is essential that project and construction managers should acquire requisite technical and administrative skills to enhance their performance. The study also revealed that a project manager's previous experience in handling complex projects can impact on success of subsequent projects handled by the manager. The implication for practice is that project managers' ability to handle complex projects should be considered when assigning project managers to projects. In addition, project managers' ability to handle complex projects should be considered when assigning project managers to projects.

5.3 Recommendations for future research

The following recommendations are put forward:

1 Further research may be carried out to establish the relationship between the CSFs of construction projects and associated delay factors.
2 The study focused on 42 CSFs. More extensive CSFs can be engaged for further study.
3 Subsequent study on CSFs of construction projects can utilize the Delphi method (which uses group consensus) for data collection, as opposed to questionnaire used for this study.

References

Adedeji, A. N., Sidique, S. F., Rahman, A. A., & Law, S. H. (2016). The role of local content policy in local value creation in Nigeria's oil industry: A structural equation modelling (SEM) approach. *Resources Policy*, *49*, 61 - 73.

Al-Momani, A. H. (2000). Construction delay: A quantitative analysis. *Journal of Project Management*, *18*, 51 - 59.

Al-Tmeemy, S. H., Abdul-Rahman, H., & Harun, Z. (2011). Future criteria for success of building projects. *International Journal of Project Management*, *29*, 337 - 348.

Anyanwu, C. I. (2013). Project cost control in the Nigerian construction industry. *International Journal of Engineering Science Invention*, *2*(12), 65 - 66.

Ashley, D. B., Lurie, C. S., & Jaselskis, E. J. (1987). Determinates of construction project success. *International Journal Project Management*, *18*(2), 69 - 79.

Assaf, S. A., & Al-Hejji, S. (2006). Causes of delay in large construction projects. *International Journal of Project Management*,*24*(4), 349 - 357.

Avots, I. (1969). Why does project management fail? *California Management Review*, *12*(1), 77 - 82.

Bakare, A. S. (2011). Local content policy in oil sector and the capacity utilization in Nigerian manufacturing industry. *Business Management Review*, *1*(6), 82 - 92.

Baker. B. N., Murphy, D. C., & Fisher, D. (1983). *Factors affecting project success - Project management handbook*. New York, NY: Van Nostrand Reinhold.

Balogua, J. (2012). Nigerian local content: Challenges and prospects. *International Association for Energy Economics*, *3*, 23 – 26.

Cao, Q., & Hoffman, J. J. (2011). A case study approach for developing a project performance evaluation system. *International Journal of Project Management*, *29*(2), 155 - 164.

Carbaugh, R. (2017). *Contemporary economics: An applications approach* (8th ed.). London: Routledge.

Cattell, R. B. (1966). The Scree test for the number of factors. *Multivariate Behavioural Research*, *1*, 245 - 276.

Chan, D. W. M., & Kumaraswamy, M. M. (1997). A comparative study of causes of time overruns in Hong Kong construction projects. *Journal of Management Engineering*, *15*(1), 55 - 63.

Chan, D. W. M.,& Kumaraswamy, M. M. (2002). A comparative construction duration: Lessons learnt from Hong Kong building projects. *International Journal of Project Management*, *20*, 23 - 35.

Chan, A. P. C., Scott, D., & Chan, A. P. L. (2004). Factors affecting the success of a construction project. *Journal of Construction Engineering and Management*,*130*(1), 153 - 155.

Chan, T. W. C. (2012). The principal factors affecting construction project overhead expenses: An exploratory factor analysis approach. *Construction Management and Economics*, *30*, 903 - 914.

Chapman, C. B., & Ward, S. C. (2002). *Managing project risk and uncertainty*. Chichester: John Wiley.

Chua, D. K. H., Kog, Y. C., & Loh, P. K. (1999). Critical success factors for different project objectives. *Journal of Construction Engineering and Management*, *125*(3), 142 - 150.

Cleland, D. I., & King, W. R. (1983). *Project management and the systems approach*. London: McGrwa-Hill.

Dalcher, D. (2012). The nature of project management: A reflection on the anatomy of major projects. *International Journal of Managing Projects in Business*, *5*(4), 643 – 660.

Eik-Andresen, P., Landmark, A. D., & Johansen, A. (2015). Managing cost and time in a large portfolio of projects. *Procedia Economics and Finance*, *21*, 502 - 509.

Elhag, T. M. S., & Boussabaine, A. H. (1998). *Factors affecting cost and duration of construction projects*. Liverpool, UK: University of Liverpool.

Ericson, R. V., & Doyle, A. (2004). *Uncertain business*. Toronto: Toronto University.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*, 272–299.

Flyvbjerg, B., Bruzelius, N., & Rothengatter, W. (2003). *Megaprojects and risk: An anatomy of ambition*. Cambridge: Cambridge University Press.

Flyvbjerg, B., Garbuio, M., & Lovallo, D. (2009). Delusion and deception in large infrastructure projects: two models for explaining and preventing executive disaster. *California Management Review*, *51*, 170 - 193.

Gorsuch, R. L. (1983). *Factor analysis*. Hillsdale, NJ: Erlbaum.

Gunduz, M., Nielsen, Y., & Ozdemir, O. (2013). Quantification of delay factors using the relative importance index method for construction projects in Turkey. *Journal of Management in Engineering*, *29*(2), 133 - 139.

Hair, J., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate data analysis* (4th ed.). New Jersey: Prentice-Hall.

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published research: Common errors and some comment on improved practice. *Educational and Psychological Measurement*, *2*, 12 -20.

Hess, P. N. (2016). *Economic growth and sustainable development*. London: Routledge.

Hillson, D. (2004) *Effective opportunity management for projects*. London: Taylor & Francis Group.

Hodgson, D., & Cicmil, S. (2006). *Making projects critical*. Basingstoke: Palgrave Macmillan.

Hwang, B., & Lim, E. J. (2013). Critical success factors for key project players and objectives: Case study of Singapore. *Journalof Construction Engineering and Management*, *139*(2), 204 - 215.

Iboh, A. A., Adindu, C. C., & Oyoh, A. J. (2013). Public private partnership construction project disputes in Nigeria. *Journal of Research in National Development*, *11*(1), 6 - 11.

Ihua, U. B., Olabowale, O. A., Eloji, K. N., & Ajayi, C. (2011). Entrepreneurial implications of Nigeria's oil industry local content policy: Perceptions from the

Niger Delta Region. *Journal of Entrepreneur Communities: People Places Global Economics, 5*(3), 223 - 241.

Ika, L.A. (2009). Project success as a topic in project management journals. *Project Management Journal, 40*(4), 6 - 19.

Ika, L. A., Diallo, A., & Thuillier, D. (2012). Critical success factors for World Bank projects: An empirical investigation. *International Journal of Project Management,30*, 105 - 116.

Isa, R. B., Jimoh, R. A., & Achuenu, E. (2013). An overview of the contribution of construction sector to sustainable development in Nigeria. *Journal of Business Management,1*(1), 1 - 6.

Isaac, S. & Michael, W. B. (1997). *Handbook in research and evaluation*. California: Educational and Industrial Testing Services.

Isik, Z., Arditi, D., Dikmen, I., & Birgonul, M. Y. (2009). Impact of corporate strength/weakness on project management competencies. *International Journal Project Management, 27*(6), 629 - 637.

Jugdev, K., & Muller, R. (2005). A retrospective look at our evolving understanding of project success. *Project Management Journal, 36*(4), 19 - 31.

Jung, S. & Lee, S. (2011). Exploratory factor analysis for small samples. *Behaviour Research Methods, 43*(3), 701 – 709.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational & Psychological Measurement*, 20, 141 - 151.

Kaming, P. F., Olomaiyr, P. O., Harris, F. C., & Holt, G. D. (1997). factors influencing construction cost and time overruns on high-rise projects in Indonesia. *Construction Management Economics,15*(1), 83 - 94.

Kasmu, A. M., & Usman, M. D. (2013). Delay in Nigerian construction industry. *Journal of Environmental Sciences and Resources Management,5*(2), 120 - 126.

Khang, D. B., & Moe, T. L. (2008). Success criteria and factors for international development projects: a life cycle-based framework. *International Journal Project Management, 39*(1), 72 - 84.

Kog, Y. C., & Loh, P. K. (2012) Critical success factors for different components of construction projects. *Journal of Construction Engineering and Management*, *138*(4), 520 - 528.

Kwikael, O., & Globerson, S. (2006). From critical success factors to critical success processes. *International Journal of Production Research*, *44*(17), 3433 - 3449.

Locke, D. (1984). *Project Management*. New York, NY: St. Martin's Press.

Martin, C. C. (1976). *Project Management*. New York, NY: Amaco.

Mbamali, I., & Okotie, A. J. (2012). An assessment of the threats and opportunities of globalization on building practice in Nigeria. *American International Journal of Contemporary Research*, *2*(4), 143 - 150.

Meredith, J. R., & Mantel, S. J. (2003). *Project management: A managerial approach*. New York, NY: John Wiley & Sons.

Miller, R., & Lessard, D. R. (2000). *The strategic management of large engineering projects*. Cambridge: MIT Press.

Monday, J. U. (2015). Local content policy, human capital development and sustainable business performance in the Nigerian oil and gas industry. *Journal of Management Sustain*, *5* (1), 30 - 39.

Morris, P. W. G. (2013a). *Reconstructing project management*. Chichester: Wiley-Blackwell.

Morris, P. W. G. (2013b). The trajectory of project management: Why EPOS is important. *Engineering Project Organization Journal*, *3*(2), 66 – 70.

Morris, P. W., & Hough, G. H. (1987). *The anatomy of major projects*. New York, NY: John Wiley & Sons.

Morris, P. W. G., & Geraldi, J. (2011). Managing the institutional context for projects. *Project Management Journal*, *42*(6), 20 - 32.

Morris, P. W. G., Pinto, J. K., & Soderlund, J. (2011). *The Oxford handbook of project management*. Oxford: Oxford University Press.

Olawale, O. I., Ibraheem, A. A., &Salimonu, A. A. (2011). Project management practice in Nigerian public sector: An empirical study. *Australian Journal of Business and Management Research*, *1*(8), 1 - 7.

Olowo-Okere, E. O. (1985). Construction industry in Nigeria. *Journal for Building and Civil Engineering Contractors in Nigeria*,*2*(2), 6 - 10.

Orr, R. J., Scott, W. R., Levitt, R. E., Artto, K., & Kujala, J. (2011). Global projects: Distinguishing features, drivers, and challenges. In: W. R. Scott, R. E. Levitt, R. J. Orr, (Eds.), *Global Projects: Institutional and Political Challenges*. Cambridge University Press, Cambridge.

O'Sullivan, A., & Sheffrin, S. M. (2003). *Economics: Principles in action*. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Osborne, J. W., & Fitzpatrick, D. C. (2012). Replication analysis in exploratory factor analysis. What it is and why it makes your analysis better. *Practical Assessment, Research & Evaluation*, *17*(15), 1 – 8.

Overall, J. E., & Klett, C. J. (1972). *Applied multivariate analysis*. New York, NY: McGraw- Hill.

Ovadia, J. S. (2013). The Nigerian 'one percent' and the management of national oil wealth through Nigerian content. *Science Society*, *77*(3), 315 - 341.

Oyewobi, L.O., Ganiyu, B. O., Oke, A. A., Ola-awo, A.W., & Shittu, A.A. (2011). Determinants of unethical performance in Nigerian construction. *Journal of Sustainable Development*, *4*(4), 175 - 180.

Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2005). *Making sense of factor analysis: The use of factor analysis for instrument development in health care research*. California: Sage.

Pinto, J. K., & Prescott, J. E. (1988). Variations in critical success factors over the stages in the project life cycle. *Journal of Management*, *14*, 5 - 18.

Pinto. J. K., & Slevin, D. P. (1989). Critical factors in successful project implementation. *IEEE Transactions on Engineering Management*,*34*, 22 - 27.

Project Management Institute (2013). *A Guide to the Project Management Body of Knowledge*. Newtown Square, PA: PMI.

Puthamont, S., & Chareonngam, C. (2007). Strategic project selection in the public sector. *International Journal of Project Management*, *25*, 177 - 188.

Rashvand, P., & Majid, M. Z. A. (2014). Critical criteria on client and customer satisfaction for the issue of performance measurement. *Journal of Management in Engineering, 30*(1), 10 - 12.

Rubin, I. M., & Seelig, W. (1967). Experience as a factor in the selection and performance of project managers. *IEEE Transactions on Engineering Management*, 14(3), 131 – 135.

Russell, R. S., & Taylor, B. W. (2003). *Operations management*. New Jersey, USA: Pearson Education.

Sayles, L. R., & Chandler, M. K. (1971). *Managing large systems*. New York, NY: Harper and Row.

Schultz, R. L, Slevin, D. P., & Pinto, J. K. (1987). Strategy and tactics in a process model of project implementation. *Interfaces*, *17*(3), 34 - 46.

Shahu, R., Pundir, A. K., & Ganapathy, L. (2012). An empirical study on flexibility: A critical success factor of construction projects. *Global Journal of Flexible Systems Management*, *13*(3), 123 - 128.

Soderlund, J. (2011). Pluralism in project management: Navigating the crossroads of specialization and fragmentation. *International Journal of Management Reviews*, *13*, 153 - 176.

Stephen, B. A. (2011). Local content policy in oil sector and the capacity utilization in Nigerian manufacturing industry. *Business and Management Review*, *1*(6), 82 - 92.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics*. Boston: Pearson Education.

Tabish, S. Z. S., & Jha, K. N. (2012). Success traits for a construction project. *Journal of Construction Engineering and Management*, *138*(10), 1131 - 1138.

Thi, C. H., & Swierczek, F.W. (2010). Critical success factors in project management: Implication from Vietnam. *Asia Pacific Business Review*, *16*(4), 567 - 589.

Thompson, B. (2004). *Exploratory and confirmatory factor analysis: Understanding concepts and applications*. Washington, DC: American Psychological Association.

Tukel, O. I., & Rom, W. O. (2001). An empirical investigation of project evaluation criteria. *International Journal of Operation and Production Management*, *21*(3), 400 - 416.

Uher, T. E., & Loosemore, M. (2004). *Essentials of construction project management*. London: University of North South West (UNSW) Press.

Van Marrewijk, A., Clegg, S. R., Pitsis, T. S., & Veenswijk, M. (2008). Managing public- private megaprojects: Paradoxes, complexity, and project design. *International. Journal of Project Management*, *26*, 591 - 600.

Walid, B., & Oya, I. T. (1996). A new Framework for determining critical success/failure factors in project. *International Journal of Project Management*, *14*(3), 141 - 151.

Westerveld, E. (2003). The project excellence model: Linking success criteria and critical success factors. *International Journal of Project Management, 21,* 411 - 418.

Winch, G. M. (2013). Escalation in major projects: Lessons from the Channel Fixed Link. *International Journal of Project Management*, *31*, 724 - 734.

Williams, T. M., Samset, K., & Sunnevag, K. J. (2009). *Making essential choices with scant information: Front-end decision-making in major projects*. Basingstoke: Palgrave Macmillan.

Williams, T. M., Klakegg, O. J., Walker, D. H. T., Andersen, B., & Magnussen, O. M. (2012). Identifying and acting on early warning signs in complex projects. *Project Management Journal*, 43, 37 - 53.

Yong, Y. C., & Mustaffa, N. E. (2013). Critical success factors for Malaysian construction projects: An empirical assessment. *Construction Management and Economics, 31*(9), 959 - 978.

Zwikael, O., & Globerson, S. (2006). Evaluating the quality of project planning: A model and field results. *International Journal Production Research*, *42*, 1545 - 1556.

Zwick, W. R., & Velicer, W. F. (1986). Comparison of five rules for determining the number of components to retain. *Psychological Bulletin*, *99*(3), 432 - 442.