ANALYSIS OF PROJECT SUCCESS CRITERIA IN THE NIGERIAN CONSTRUCTION INDUSTRY

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Abstract

This paper examined the relative importance of the project success criteria in the Nigerian construction industry. It also determined the correlation among the project success criteria. Based on the literatures reviewed, the study proposed a framework for measuring project success in the construction industry. The respondents for the study were the government, private clients, consultants and contractors. Three hundred copies of questionnaires were distributed to capture data on the subject, but only 86 were returned and used for the study. The paper captured respondents that are resident in Lagos state, Nigeria and chosen by convenience from selected organizations used for the study. The data were analysed with SPSS 16 through the use of frequencies, mean scores, factor analysis and correlation. Factor analysis was employed because the mean scores showed that all the project success criteria were at least important. Nine principal components were finally merged into 4 through the factor analysis using the Varimax rotation with Keiser normalization. The study found out that all the project success criteria were important but their level of importance differs according to the factor analysis carried out. Therefore, it was concluded that there are four major components of construction project success in Nigeria- user-related factors, professionals' factors, organisational factors and other minor factors. The minor factors were found to be related to both organizations and projects but were not highly rated by respondents for determining construction project success. The study also concludes that project success criteria goes beyond meeting cost, time and quality target, it includes users' satisfaction, professionals' fulfilment and achievement of organizational goals. The recommendation of the study was that for construction projects to be successful, attention must be paid to users' related factors, professionals' factors and organizations' factors.

Keywords: *Construction industry, Effectiveness measures, Factor analysis, Nigeria, Project success*

1.0 Introduction

Project success criteria refers to the achievement of the goals and objectives of a project, user satisfaction and the use of a project (20) while project success refers to a perception that is based on meeting technical performance specifications or missions to be performed (13). Pariff and Sanvido (1993) defined project success as an intangible perspective feeling that varies with management expectations, persons and project phases. Takim and Adnan (2008) viewed project success as effectiveness measures plus efficiency measures. Traditionally, the criteria for measuring project success had been adjudged to be scheduled time, budgeted cost and required quality (2, 6, 10, 5) but all these were regarded as efficiency measures (20). Efficiency was broadly understood as the maximisation of output for a given level of input or resources, while effectiveness was directed to the achievement of goals or objectives (20). Further to this, (11) explained that efficiency is to do things right while effectiveness is to do the right things. Ika (2009) disagreed with the traditional criteria of project success by noting that projects have often enough been delivered within time, cost and quality only to be considered failures while other projects that have exceeded time or cost constraints are generally considered successful. The motive behind this assertion was that cost, time and quality can measure project success though, they sometimes fail in their judgements especially as time passes on.

Although these basic criteria (cost, time and quality) are easy and timely to measure, they have been criticized on the ground of inadequacy for reasons such as insufficiency on their own to

measure project success unless they are continuously measured, inadequate vision of the potential for improvement and the information obtained usually arriving too late for corrective actions to be taken (1). It is on this ground that many other writers (5,14,17, 3,1) concluded in their studies that project success criteria is far beyond time, budget and quality as they noted that project success criteria are multidimensional.

Therefore, the study would determine the project success criteria for building projects in Lagos state from the multidimensional perspectives of the government, private clients, consultants and contractors. The study would also determine the relationship among the project success criteria used to measure construction project success.

2.0 Project Success Criteria

Project success criteria have been explored by various researchers in the construction industry. Traditionally, (10) declared budget, schedule, quality, clients' satisfaction, project team (people and organisational), tools and techniques, health, safety and environment as the criteria for measuring construction project success. Chan (2001) noted that cost, time, safety, participant's satisfaction, user expectation/satisfaction, environmental performance, commercial value and quality are the measure of construction project success. The argument raised on these criteria was that they all considered the process which takes care of events that occur up to project completion and these may not be able to measure project success after project completion. The criteria for measuring project success after completion was regarded as being more important than that used before project completion.

Based on this (17) categorised project success criteria into project management, procurement, client, design team, contractor, project manager, business and work environment. This was supported by (3) position which classified project success into project management success and product success. Al-Tmeemy, Abdul-Rahman and Harun (2010) also classified them into project management success, product success and market success. This shows that the authors view project success as a function of product, project management and market success (after completion).

Atkinson (1999) highlighted many project success criteria that were categorized into four with a view to providing how the criteria work. Hence, a model to understanding the success criteria was developed.

Table 1: Understanding project success criteria

Iron Triangle	The information system	Benefits (organization)	Benefit (stakeholder community)
Cost	Maintainability	Improved efficiency	Satisfied users
Quality	Reliability	Improved effectiveness	Social and Environmental impact
Time	Validity	Increased profits	Personal development
	Information-quality	Strategic goals	Professional learning, contractors profits
	Use	Organisation-learning	
		Reduced waste	Capital suppliers, content project Team, economic impact to surrounding community

Source: Atkinson (1999:341)

In summary, project success criteria as a subject has been largely discussed by authors of project management since the 1960's to date. Table 2 shows the extract of the project success criteria agreed upon by authors that published in the Project Management Journal (PMJ) and International Journal of Project Management (IJPM) between period 1 (1960-1980), period 2 (1980s-2000s) and period 3 (21st century).

Table 2: Measuring project success across time

Research focus	Period 1 1960s-1980s	Period 2 1980s-2000	Period 3 21st Century
Project Success criteria	'Iron triangle' (time, cost, quality)	iron triangle, client benefit to organisation End-user satisfaction Benefit to stakeholders Benefit to project Personnel	Iron triangle, strategic objective of organisation and business success, End-user's satisfaction, Benefit to stakeholders, Benefit to project, Personnel, Symbolic and rhetoric evaluations of success and failure

Source: Ika (2009:11)

Table 2 indicates that as time passes on, the understanding of project success and the criteria for its measurement increase. Period 1 shows that between 1960 and 1980, the iron triangle reigned as the criteria for measuring project success. During this period, papers were theoretical, but during the second period (1980-2000) empirical works dominated all through to period 3 (the 21st century). It can be observed that there is no much difference between the second and third period and this is probably because those periods witnessed mostly empirical papers.

2.1 Models of Project Success

Many models have been developed to reflect both traditional and modern criteria for measuring project success. Kendra and Taplin (2004) believed that project success can be derived through four dimensions which are project manager skills and competencies, performance measurement systems, organisational structures at project level and supporting management practices.

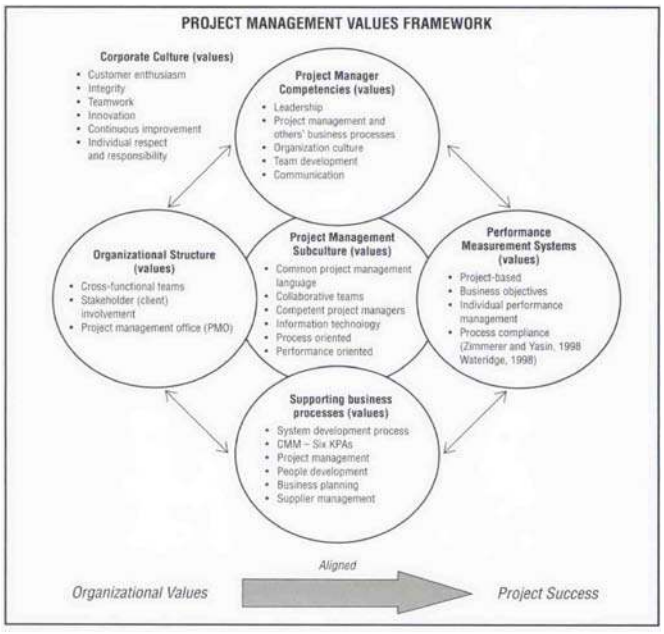

Figure 1: Framework for project success
Source: Kendra and Taplin (2004:41)

The authors believe that a change made to one of the dimensions does not affect the other. However, if an organisation is socio-technical in nature, the dimensions would be interdependent. Camilleri (Not dated) noted that project success can be measured via its completion time, budget, specifications, consistency of the use of project management technology, assigning responsibilities to attain benefits, having mechanisms to capture and share lessons learnt and programmatic style to organisational initiatives. All these success measures appear at the outputs, outcomes and impact on business strategy levels of a project as shown in figure 2.

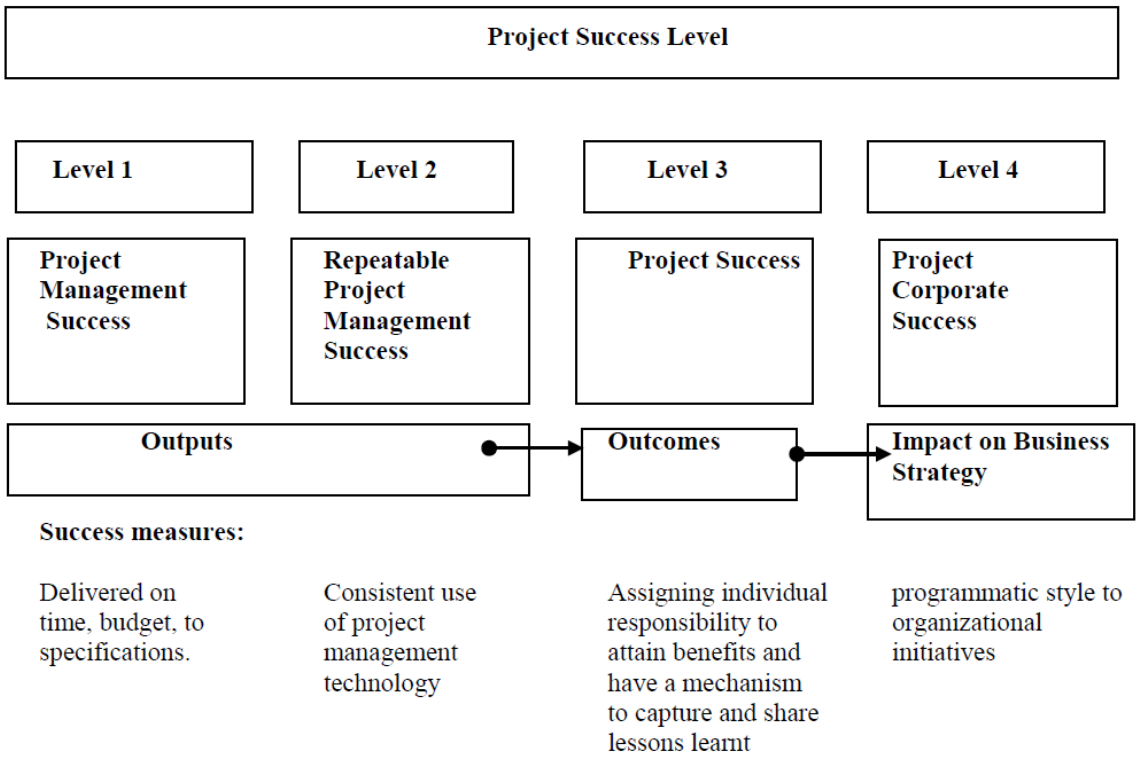

Figure 2: Success measures at four project success levels
Source: Camilleri (2004:18)

It is important to note that there is a definite distinction between the four success levels. Project management success refers to whether a particular project has produced the desired outputs (deliverables), while project success refers to whether a particular project has produced the desired outcomes (project purpose or objective). Hence, project outputs and outcomes are distinct. Repeatable project management success refers to the organisation's ability to consistently execute projects that have produced the desired outputs. Corporate success refers to whether the outcomes produced have the intended impact on the business strategy of the organisation.

Al-Tmeemy, et al. (2010), after a comprehensive review of four project success models and an empirical analysis of project success criteria concluded that project success is based on basically project management success, product success and market success. However, all these criteria are based on the responses of contractors alone.

In summary, the results distinguished three dimensions of project success, which are Project Management Success, Product Success and Market Success as described in Figure 3. The proposed framework incorporates the success dimensions, which considered the project's execution period and customer's perspective, as well as the impact of project on the company's business in long term. The proposed framework will provide an essential and appropriate judgment for measuring project success in the short-term context of the project development as well as the long-term financial objectives of the company. This will clarify the managers' thoughts and enhance their knowledge about project success, and support the development of measuring performance of building projects as well.

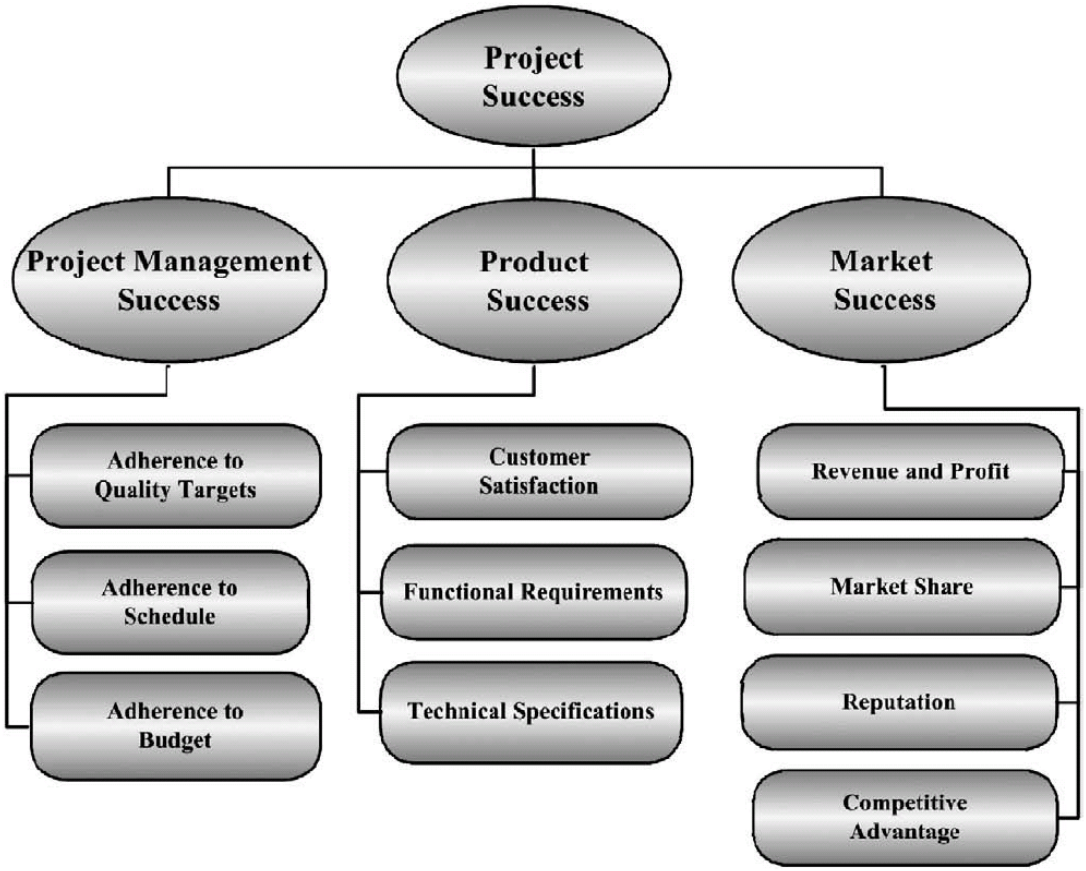

Figure 3: Model of project success criteria
Source: Al-Tmeemy, *et al* (2010:10)

Nelson (2005) concluded that project success is both process and outcome related as shown in figure 4.

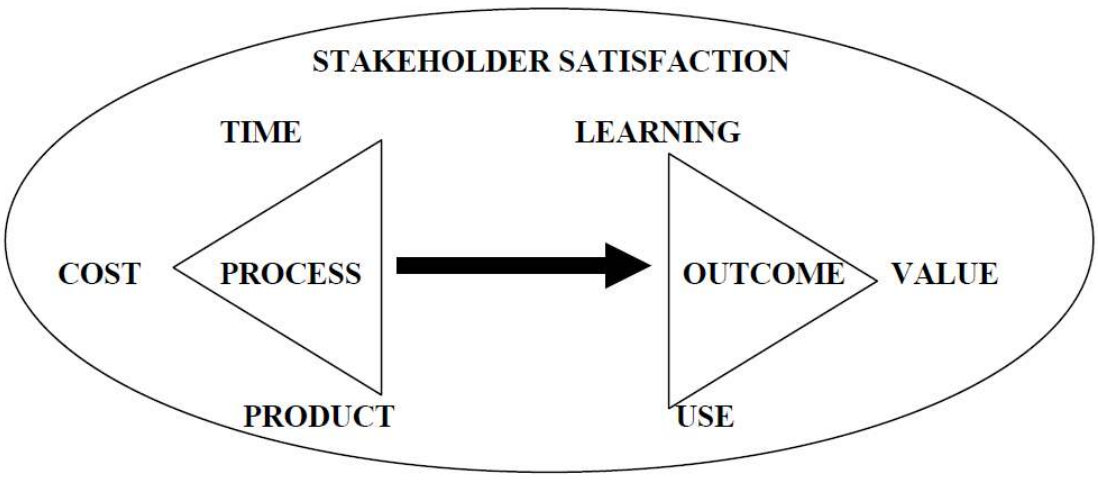

Figure 4: Project Success Criteria
Source: Nelson (2005:364)

The three process-related criteria are time (the project came in on schedule), cost (the project came in on budget) and product (the project produced a product of acceptable quality and met other product-related specifications, including requirements, usability, ease of use, modifiability, and maintainability). The three outcome-related criteria include use (the project's

resulting product/service is being used by its target constituencies), learning (the project increased stakeholder knowledge and helped prepare the organisation for future challenges) and value (the project will directly result in improved efficiency and/or effectiveness for the client organization(s)). Taking the six criteria yield a more comprehensive view of project success. To this end, the relative importance of each criterion needs to be clearly defined and documented at the beginning of a project, and revisited as necessary throughout its life.

Shenhar et al. (1997) summarised the project success criteria into project efficiency, impact on customer, business success and preparing for the future as shown in figure 5. Project efficiency is the first dimension and the short-term measure expressing the efficiency with which the project process has been managed. It simply tells us whether the project was completed on time and within the specified budget. This is the immediate dimension with which the project can be assessed, first during execution, and immediately after completion. Although success in this dimension may indicate a well-managed, efficient project, it may not indicate success in the long-term nor benefit to the organisation. Impact on the customer is the second dimension that relates to the customer and/or the user of the end result. Business and direct success is the third dimension that addresses the direct impact the project may have on the organisation. In the business context, did it provide sales, income, and profits as expected? Did it help increase business results and gain market share? However, this dimension may also apply to projects not aimed at building new products.

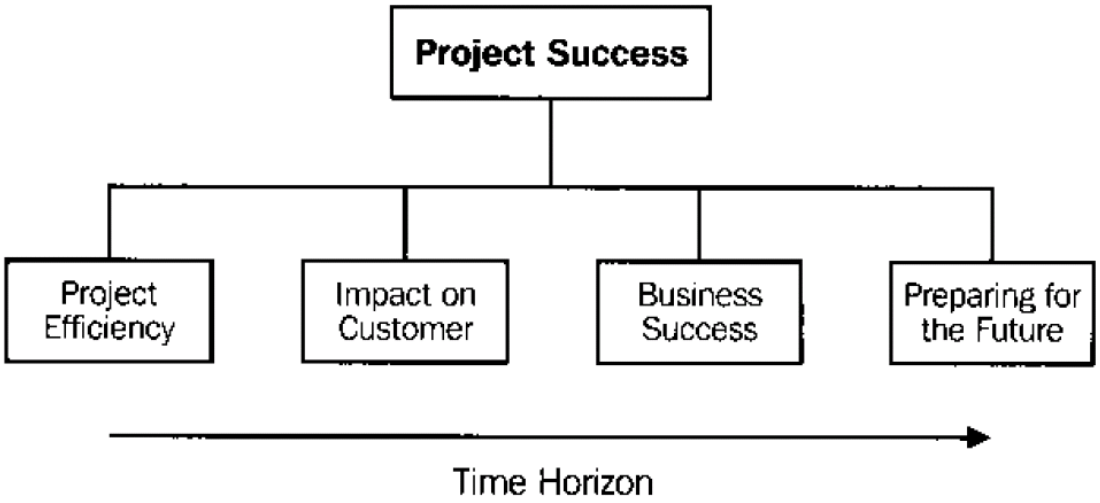

Figure 5: Project success criteria
Source: Shenhar, et al (1997:9)

Chan (2001) prepared a consolidated framework for measuring project success by acknowledging quality, cost, time, safety, participants' satisfaction, user expectation/satisfaction, environmental performance and commercial/profitable value as the major criteria for project success as shown in figure 6. While, Shenhar and Wideman (2001) used factor analysis to model thirteen project success criteria into four primary categories or criteria as shown in Table 3. Initially, thirteen separate success criteria were identified, plus an overall project success assessment which includes functional performance, meeting technical specifications, meeting schedule goal, meeting budget, fulfilling customer needs, solving a customer's problem, the extent to which the customer is using the product, customer satisfaction, commercial success, creating a larger market share, creating a new market, creating a new product line and developing a new technology.

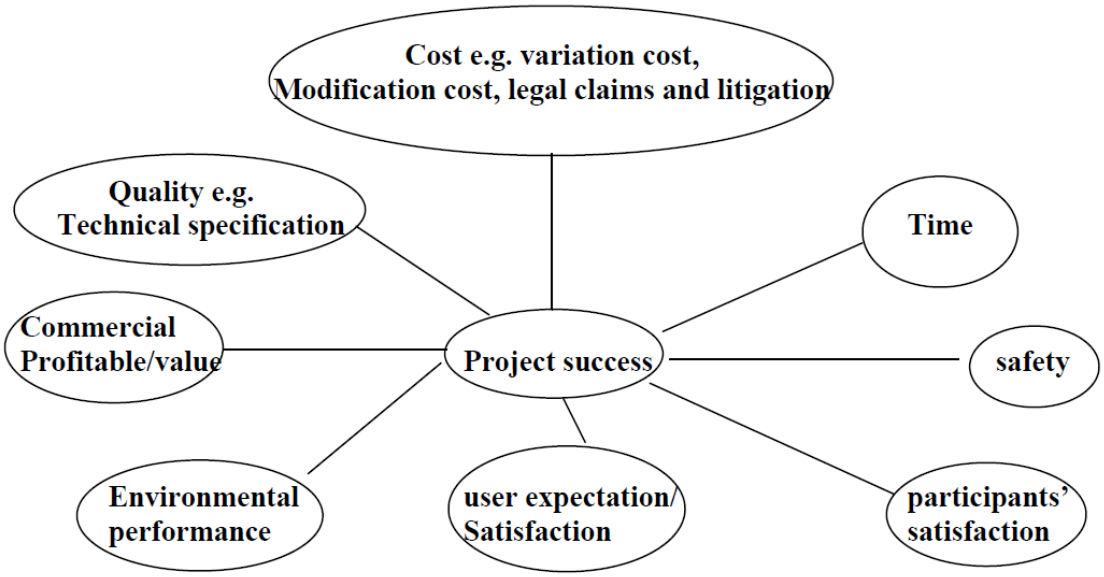

Figure 6: Project success criteria

Source: Chan (2001:8)

Table 3: Principal Success Criteria

Success Category	Measurable Success Criteria
Internal Project Objectives (Pre-completion)	➢ Meeting schedule ➢ Within budget
Benefit to Customer (Short term)	➢ Meeting functional performance ➢ Meeting technical specifications &standards ➢ Favorable impact on customer, customer's gain ➢ Fulfilling customer's needs ➢ Solving a customer's problem ➢ Customer is using product ➢ Customer expresses satisfaction
Direct Contribution (Medium term)	➢ Immediate business and/or commercial success ➢ Immediate revenue and profits enhanced ➢ Larger market share generated
Future Opportunity (Long term)	➢ Will create new opportunities for future ➢ Will position customer Competitively ➢ Will create new market ➢ Will assist in developing new technology ➢ Has, or will, add capabilites and competencies

Takim and Akintoye (2002) did a comprehensive review on the criteria for measuring project success and thereafter, came up with a model that shows the relationship between success factors, project performance and project success as illustrated in figure 7.

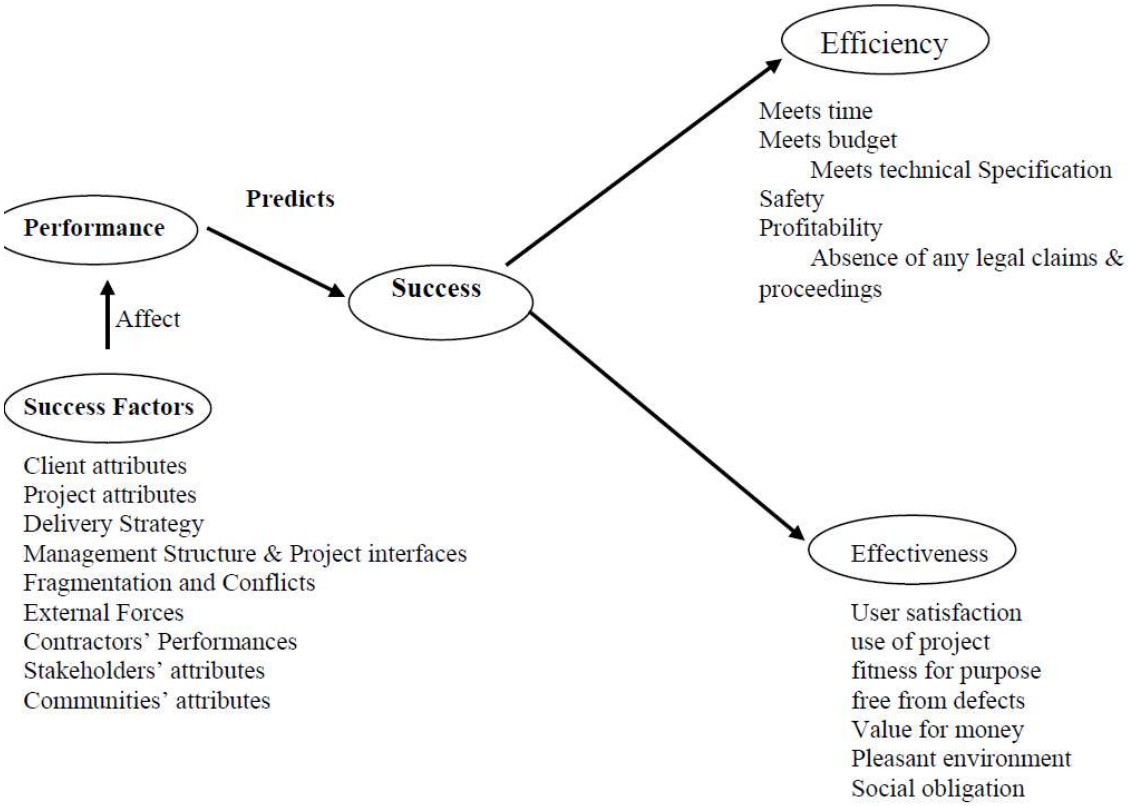

Figure 7: Relationship between success factors, project performance and project success
Source: Takim and Akintoye (2002:551)

Clients will not be satisfied if the end product fails to meet their price, quality, time frame, functionality and delivery performance standard. In relation to that, the consultants will not develop their skills and knowledge, or make the effort to design and manage processes, unless the client meets their required employment conditions. The contractors and suppliers may not continue to deliver good products and resources to clients or to any company that fails to give them an opportunity to earn a reasonable return on the investment of their time and capital. As a result, end-users will not be happy if the end product does not meet their requirement in terms of functionality and quality of service. In essence, successful stakeholders' performance has to be measured and managed in order to ensure their continual participation and co-operation in a construction project.

Deacon (2011) agreed with (20) by equating the addition of project efficiency (time, cost and requirement) and project effectiveness (end users' satisfaction, return on investment) to project success. It was also noted that project success criteria can be divided into project management (scope, schedule, budget and quality) and outcomes (client satisfaction, other stakeholders' satisfaction, product quality and return on investment). The study conducted by (8) indicated that quality of project, construction cost, construction time, occupational health and safety, labour dependency, contractors' project management, contractors' manpower capacity, construction flexibility, environment friendliness and level of technology are severe criteria for measuring project performance.

Based on the literatures reviewed on construction project success criteria, the study proposed the following criteria for project success in the construction industry.

Figure 8 depicts the framework for project success criteria in the construction industry. Project success in the past has been measured monotonously based on cost, time, quality and

possibly safety. However, modern criteria are based on the perspectives of stakeholders which include the clients, consultants, contractors, users and market success.

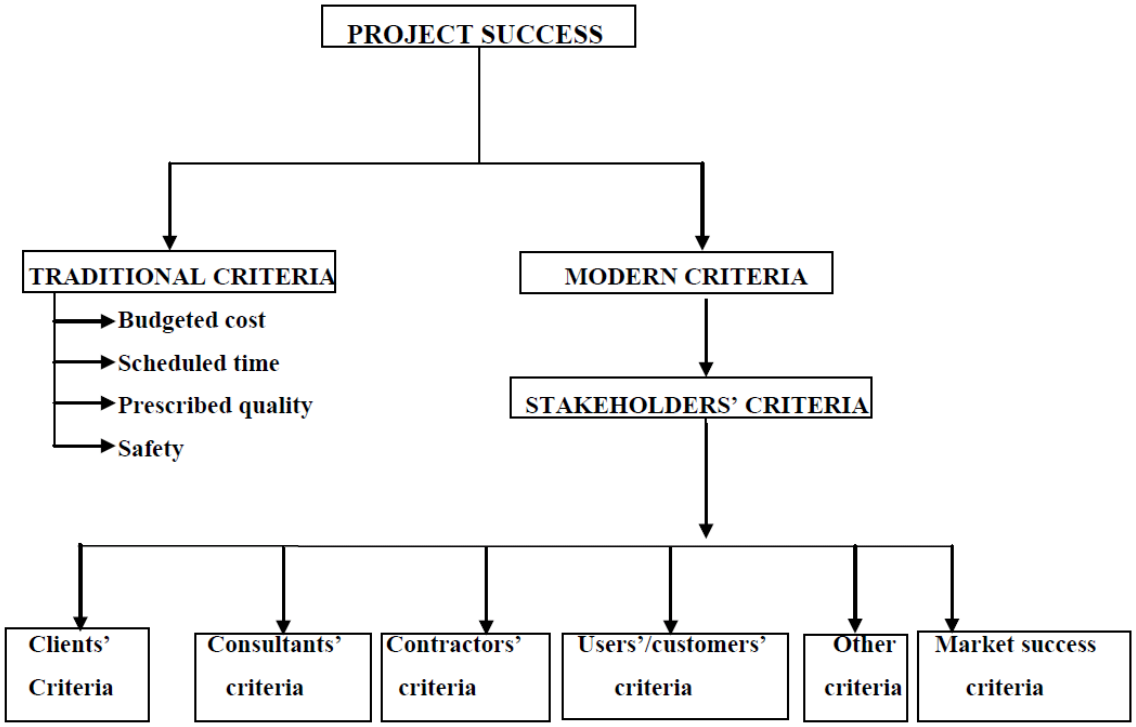

Figure 8: Framework of project success criteria

3.0 Methodology

A structured close ended questionnaire was designed to capture data on the relative importance of project success criteria. Three hundred questionnaires were distributed among the major stakeholders (Government, private clients, contractors and consultants) in the Nigerian construction industry to capture relevant data on the subject. The project success criteria of all the stakeholders were combined in the single questionnaire and they are expected to choose according to the importance of those criteria. However, only eighty six of them were retrieved due to low response, thus giving a response rate of 28.67%. The consultants comprised of the Architects, Builders, Quantity Surveyors and Engineers. The questionnaire was divided into socio-economic characteristics of respondents and project success criteria related questions. The data for the study was collected from Lagos state, Nigeria and the reason for selecting Lagos state was because of its large volume of construction activities within the country.

The convenience sampling technique (respondents within relevant organisations that were suitable to respond to the questionnaire and were willing to respond were used for the study) was used to collect data from respondents in relevant organizations. The government respondents were obtained from the Lagos State Development and Property Corporations (LSDPC) and Lagos State Ministry of Works and Housing (LSMWH). Private clients were obtained from the Lagos State chapter of Real Estate Development Association of Nigeria (REDAN), contractors were obtained from the register of the Corporate Affairs Commission(CAC) and the consultants were obtained from professional Registration Boards like Architect Registration Council of Nigeria (ARCON), Council for Regulation of Engineering (COREN), Council of Registered Builders of Nigeria (CORBON) and Quantity Surveyors Registration Board of Nigeria (QSRBN) that are resident in Lagos state.

The project success criteria related questions were based on a 5 point Likert scale ranging from 1, not effective to 5, extremely effective so that statistical analysis could be used to extract the important criteria from the non-important ones. It is worth mentioning at this juncture that the questionnaire for this study was based on the work of Takim and Adnan (2008) that was carried out in Malaysia. This was done in order to determine the construction projects' success criteria in Lagos state, Nigeria. The questionnaire used for the work carried out in Malaysia was not sighted by the authors, the questionnaire for this study was developed from the results of Takim and Adnan (2008). Adjustments were made to the general part of the questions while the part of Likert scale was not adjusted.

The reliability of the questionnaire used for the study was tested using the Cronbach's Alpha co-efficient which gave 0.895. The data from the study was analysed using the Statistical Package for Social Sciences (SPSS 16). The frequencies, percentages, mean scores, P values, factor analysis and correlation were the statistical methods used to obtain the important project success criteria in Nigeria. The results of the study were principally presented in tables. The factor analysis was carried out using the principal component analysis with Varimax rotation so that criteria that do not contribute significantly to the component variance will be eliminated. The Kaiser-Meyer Olkin sampling adequacy test and Bartlett's test of sphericity was carried out to assess the suitability of the application of factor analysis and the value got are KMO = 0.621, df = 171, Barlett's test of sphericity = 1561 and Sig (P) = 0.0000.

4.0 Results and Discussions

Table 4 shows the socio-economic characteristics of the respondents used for this study. 20.9% of the respondents work in government organisation, 20.9% work with client organizations, 34.9% were consultants and 23.3% were contractors. 14% of the respondents practice Architecture, 37.2% practice Civil/Structural engineering, 18.6% practice Building, 7% practice Quantity surveying and 23.3% practice other construction related professions. 4.7% had OND/HND, 34.9% had B.Sc/B.Tech, 55.8% had M.Sc/M.Tech, and 4.7% had other qualifications apart from the ones listed in the questionnaire. 23.3% had less than 10 years work experience, 69.8% had 10-20 years work experience, 4.7% had 21-30 years work experience and 2.3% had 31-40 years work experience. All the respondents for this study were senior staff of their respective organisations. 53.5% of the organisation had annual turnover of up to N25million, 23.3% had N25-N50million turnover, 7% had N100-N250 million turnover and 16.3% had over N250 million turnover. Also, 46.5% of the organisations engage in only Building works, 27.9% engage in civil engineering works, 9.3% engage in Mechanical and Electrical works and 16.3% engage in other areas of work. 14% of the respondents were affiliated with Nigerian Institute of Architects (NIA), 11.6% were affiliated to the Nigerian Institute of Building (NIOB), 7% were affiliated with Nigerian Institute of Quality Surveying (NIQS), 37.2% were affiliated to Nigerian Society of Engineers (NSE) and 30.2% were affiliated to other professional bodies.

Table 4: Socio-economic characteristics of respondents

	Frequency	**Percentage**
Organisation		
Government	18	20.9
Private client	18	20.9
Consultant	30	34.9
Contractor	20	23.3
Area of practice		
Architecture	12	14
Civil/structural engineering	32	37.2
Building	16	18.6
Quantity surveying	6	7.0
Others	20	23.3

Academic qualification		
OND/HND	4	4.7
B.SC/B.TECH	30	34.8
M.SC/M.TECH	48	55.8
Others	4	4.7
Work experience		
Less than 10 yrs	20	23.3
10-20 yrs	60	69.8
21-30 yrs	4	4.7
31-40yrs	2	2.3
Position in organisation		
Senior staff	86	100
Annual turnover		
Up to 25 million Naira	46	53.5
25-50 million Naira	20	23.3
100-25- million Naira	6	7.0
Over 250 million Naira	14	16.3
Workload of organisation		
Building works	40	46.5
Civil engineering works	24	27.9
Mechanical and electrical works	8	9.3
Others	14	16.3
Professional affiliation		
NIA	12	14
NIOB	10	11.6
NIQS	6	7.0
NSE	32	37.2
Others	26	30.2

Table 5indicates the position of respondents in their organisations distributed by the type of organisation. All (100%) the respondents are senior staff in their respective organization.

Table 5: Type of organisation by position of respondents in organisation

	Position in organization		
	Frequency	**Senior staff**	**Percentage**
Government	18	18	20.9
Private client	18	18	20.9
Consultants	30	30	34.9
Contractor	20	20	23.3
Total	**86**	**86**	**100**

Table 6 shows the distribution of annual turnover by the type of organisations. 39.1% of the clients and 39.1% of the consultants had annual turnover of up to N25 million, 80% of the contractors had N25-N50 million annual turnover, 66.7% of the consultants had annual turnover of N100-N250million, 71.4% of government establishments had over N250 million. The client organisations do not have much turnover as they (39.1%) all had up to N25 million turnover. From the consultants' organisations, 39.1% had up to N25 million, 20% had N25-N50 million, 66.7% had N100-N250 million, 28.6% had over N250 million turnover. 8.7% of the contractors had up to N25 million and 80% had N25-N50 million turnover. While, table 7 indicates the distribution of workload by the type of organisation. 40% of consultants engage in building works only, 35% of clients engage in building works only, 25% of government organisations deal in building works alone, 66.7% of contractors engage in civil engineering works, 16.7% of consultants engage in civil engineering works, 16.7% of government organisations engage in civil

engineering works, 50% of consultants and 50% of contractors engaged in mechanical and electrical works respectively and 42.9% of consultants engaged in other types of works apart from building, civil, mechanical and electrical works.

Table 6: Annual turnover by type of organisation

	Type of organisation									
	Government		**Client**		**Consultant**		**Contractor**		**Total**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Up to 25M	6	13	18	39.1	18	39.1	4	8.7	46	53.5
25-50M	-	-	-	-	4	20	16	80	20	23.3
100-250M	2	33.3	-	-	4	66.7	-	-	6	6.9
Over 250M	10	71.4	-	-	4	28.6	-	-	14	16.3
Total	18	20.9	18	20.9	30	34.9	20	23.3	86	100

Table 7: Workload of organisation by type of organisation

	Type of organisation									
	Government		**Client**		**Consultant**		**Contractor**		**Total**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
Building works	10	25	14	35	16	40	-	-	40	46.5
Civil Eng. works	4	16.7	-	-	4	16.7	16	66.7	24	27.9
Mech. &Electrical works	-	-	-	-	4	50	4	50	8	9.3
Others	4	28.6	4	28.6	6	42.9	-	-	14	16.3
Total	18	20.9	18	20.9	30	34.9	20	23.3	86	100

Table 8 shows the relative importance of the project success criteria used for measuring project success. The mean values of the measures were arranged in descending order and values of 4.5 and above were tagged extremely important, 3.5-4.44 values were given very important, 2.5-3.44 were given important, 1.5-2.45 were given somehow important and values less than 1.5 were given not important.

Table 8 indicates that the first eleven (11) criteria were very important while the remaining nineteen (19) were important criteria. This shows that all the criteria were important for measuring project success. The table also shows the mean values and ranking of the project success criteria from the perspectives of the government, clients, consultants and contractors. Finally, going by the P values, all the project success criteria except fitness for purpose, meets pre stated objectives, generate positive reputation, exploitation of technology and pleasant environment have non-significant mean difference.

Table 9 reveals the factor grouping of the project success criteria using the Varimax rotation with Kaiser normalization method. Nine principal components were obtained from the factor analysis with Eigen values greater than 1.0. Component 1 had Eigen value of 6.825 and explained 22.751% the components' variance, component 2 had Eigen value of 6.172 and explained 20.572% of components' variance, component 3 had Eigen value of 3.460 and explained 11.534% of components' variance, component 4 had Eigen value of 2.322 and explained 7.740% of components' variance, component 5 had Eigen value of 1.731 and explained 5.771% of components' variance, component 6 had Eigen value of 1.603 and explained 5.343% of components' variance, component 7 had Eigen value of 1.250 with 4.166% of components' variance explanation, component 8 had Eigen value of 1.208 with 4.028% of components' variance explanation and component 9 had Eigen value of 1.094 with 3.648% of components' variance explanation. The nine components were able to explain a cumulative variance of 85.553% in total. However, it could be observed that the contributions of components 4 to 9 are small (less than 10% each) when compared with the first three. The reason for the low

contributions of the components may be that project participants in the Nigerian construction industry are not bothered about future expansion, useable life expectancy and new market penetration. Issues of commissioning, depreciation, corporate mission and environment may not also be part of the concerns of project participants in the construction industry. Also the components have less than three variables each and the variables seem to be incoherent. Therefore, the variables under these components were merged into one and given the name 'minor factors' to give a total of four principal components. In addition, component 1 contains six factors which relate to user's criteria, hence the name' user related factors'. Component 2 contains seven factors which relate to the professionals and the way they carry out their works, therefore it was called 'professional factors'. Component 3 has three factors which relate to the organization, therefore it was called 'organizational factors'. Lastly, component 4 to 9 explained only a little out of the total 85.55% explained by all variables, therefore, they were merged into one component and called 'minor factors'.

Table 8: Relative importance of the project success criteria

Effectiveness	Measures of project success	Overall Mean	R	Govt. Mean	R	Client Mean	R	Cons. Mean	R	Cont. Mean	R	Sig (p)
V. Important	Benefit to client	4.21	1	4.67	1	4.67	1	3.93	7	3.80	15	0.000**
V. Important	Fitness for purpose	4.12	2	4.30	2	4.22	7	4.07	4	4.20	3	0.522
V. Important	Value for money	4.12	3	3.78	3	4.44	3	4.20	3	4.00	5	0.024*
V. Important	User satisfaction on product	4.12	4	3.78	6	4.22	8	4.33	1	4.0	6	0.022*
V. Important	Benefit to end user	4.07	5	4.00	4	3.11	17	4.07	5	5.0	1	0.000**
V.Important	Client satisfaction on service	4.05	6	4.22	3	4.33	6	4.33	2	3.20	19	0.000**
V. Important	Project functionality	3.98	7	3.22	14	4.56	2	4.07	6	4.0	7	0.000**
V. Important	Meets pre stated Objectives	3.91	8	3.78	7	4.33	5	3.67	13	4.0	8	0.136
V. Important	Stakeholders needs and expectation	3.91	9	3.56	11	4.11	9	3.93	8	4.0	9	0.014*
V. Important	Accomplish core business needs	3.56	10	3.22	15	3.33	15	3.60	14	4.0	10	0.042*
V.Important	Aesthetic value	3.51	11	3.22	16	3.44	14	3.27	20	4.20	4	0.000**
Important	Generate positive reputation	3.44	12	3.33	12	3.33	16	3.33	19	3.80	16	0.130
Important	Useable life Expectancy	3.40	13	2.78	22	4.11	10	3.73	12	2.80	26	0.000**
Important	New marketPenetration	3.40	14	2.78	26	4.44	4	3.27	21	3.20	20	0.000**
Important	Minimum cost of Ownership	3.37	15	3.0	19	3.67	12	3.0	24	4.0	19	0.002**
Important	Worth while warranty Programme	3.35	16	2.89	20	2.89	18	3.47	17	4.0	12	0.000**
Important	Easy to maintain	3.28	17	2.89	21	2.89	19	3.93	9	3.0	25	0.000**
Important	Flexible for future Expansion	3.28	18	3.44	8	3.89	11	3.40	18	2.40	27	0.000**
Important	High profit margin	3.26	19	2.78	27	2.44	23	2.87	27	5.0	2	0.000**
Important	Early occupation	3.23	20	3.33	13	2.22	28	3.80	10	3.20	21	0.000**
Important	Develop new business Relationship	3.16	21	2.67	28	2.89	20	3.60	15	3.20	22	0.041*
Important	Corporate mission	3.14	22	3.22	19	2.33	24	3.0	25	4.0	13	0.000**
Important	Excellent Commissioning Programmes	3.12	23	3.44	9	2.0	30	3.0	26	4.0	14	0.000**
Important	Increase level of Professionalism	3.09	24	3.44	10	2.78	21	3.53	16	2.40	28	0.001**
Important	Exploitation of Technology	3.07	25	2.89	22	2.78	22	3.27	22	3.20	23	0.207
Important	Pleasant environment	3.07	26	3.11	18	2.33	25	2.33	29	3.60	17	0.730
Important	Develop new Knowledge and expertise	2.95	27	2.89	23	2.22	29	3.80	11	2.40	29	0.000**
Important	Fast rectification of defects	2.88	28	2.44	30	2.33	26	3.27	23	3.20	24	0.005**
Important	Lower depreciation Cost	2.88	29	2.89	24	3.67	13	2.87	28	2.20	30	0.000**
Important	Excellent close out Process	2.67	30	2.56	29	2.33	27	2.33	30	3.60	18	0.000**

* The mean difference is significant at 0.05
** The mean difference is significant at 0.01
Reliability coefficient (Cronbach's alpha) = 0.8950
5= Extremely Effective, 4= Very Effective, 3= Effective, 2= Somehow Effective and 1= Not Effecti

Table 9: Factor grouping using Varimax rotation with Kaiser Normalization

	Principal Components (PC)								
	1	2	3	4	5	6	7	8	9
Users satisfaction on product	0.743								
Fitness for purpose	0.778								
Project functionality	0.816								
Value for money	0.838								
Meets pre stated objectives	0.695								
Stakeholders needs and expectation		0.704							
Exploitation of technology		0.891							
Increase level of professionalism		0.887							
Fast rectification of defects		0.844							
Develop new knowledge and expertise		0.793							
Easy to maintain		0.674							
Benefit to end user		0.549							
Develop new business relationship		0.528							
Worthwhile warranty programme			0.867						
Generate positive reputation			0.854						
Accomplish core business needs			0.782						
Flexible for future expansion				0.789					
Useable life expectancy				0.644					
New market penetration				0.488					
Excellent close out process					0.900				
Minimum cost of ownership					0.752				
Excellent commissioning programmes					0.456				
Corporate mission						0.862			
Aesthetic value						0.509			
Benefit to client							0.833		
Early occupation								0.750	
Client satisfaction on service								0.445	
Lower depreciation cost									0.813
Pleasant environment									0.509
Eigen value	6.825	6.172	3.460	2.322	1.731	1.603	1.250	1.208	1.094
Percentage variance explained	22.751	20.572	11.534	7.740	5.771	5.343	4.166	4.028	3.648
Cumulative percentage variance	22.751	43.323	54.857	62.597	68.368	73.711	77.877	81.905	85.553

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy = 0.621
Barlett's Test of Sphericity = 1561 df = 171 Significance p = 0.0000

Table 10 shows the correlation matrix of the variable used for this study and values greater than 0.50 were accepted to show significant correlation. User satisfaction has significant correlation with client satisfaction, project functionality and users satisfaction, value for money and users satisfaction, fitness for purpose and project functionality, easy to maintain and project functionality, fast rectification and easy to maintain are all significantly correlated. Other significant correlations include: meeting pre-stated objectives and users' satisfaction, project functionality and value for money; exploitation of technology and fast rectification of defects (0.829); level of professionalism and easy to maintain (0.612), fast rectification of defects (0.669) and exploitation of technology (0.807); new knowledge and expertise and fast rectification of defects (0.620), exploitation of technology (0.650) and level of professionalism (0.780; new business relationship and benefit to end user (0.531) and new knowledge and expertise (0.046); accomplish core business needs and positive reputation (0.591); stakeholders needs and expectations and users satisfaction (0.553), value for money (0.668); excellent commissioning programmes and client satisfaction (0.642), value for money (0.691) and stakeholders' needs and expectation (0.580); early occupation and new knowledge and expertise (0.525); worthwhile warranty programme and benefit to end users (0.621); useable life expectancy and corporate mission (0.559); minimum cost of ownership and benefit to end users (0.560); new market penetration and flexible for future expansion.

Table 10 (a): Factor grouping using Varimax rotation with Kaiser Normalization

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Client satisfaction on service	1.000														
2	User satisfaction on product	0.587	1.000													
3	Benefit to client	0.432	0.461	1.000												
4	Fitness for purpose	0.328	0.420	0.152	1.000											
5	Benefit to end-user	0.430	0.033	0.141	0.189	1.000										
6	Project functionality	0.075	0.531	0.240	0.647	0.091	1.000									
7	Value for money	0.384	0.713	0.262	0.511	0.036	0.678	1.000								
8	Easy to maintain	0.109	0.443	0.083	0.262	0.352	0.606	0.397	1.000							
9	Fast rectification of defects	0.048	0.212	0.200	0.014	0.455	0.228	0.090	0.586	1.000						
10	Meets pre-stated objectives	0.255	0.626	0.325	0.449	0.139	0.587	0.532	0.488	0.451	1.000					
11	Exploitation of technology	0.220	0.052	0.183	0.207	0.468	0.147	0.018	0.508	0.829	0.305	1.000				
12	Increase level of professionalism	0.075	0.070	0.024	0.083	0.374	0.129	0.012	0.612	0.669	0.290	0.807	1.000			
13	Develop new knowledge and Expertise	0.053	0.020	0.338	0.311	0.438	0.097	0.159	0.490	0.620	0.078	0.650	0.780	1.000		
14	Develop new business relationship	0.101	0.037	0.240	0.222	0.531	0.091	0.079	0.424	0.466	0.286	0.424	0.451	0.646	1.000	
15	Generate positive reputation	0.060	0.221	0.068	0.088	0.382	0.133	0.006	0.355	0.227	0.429	0.193	0.159	0.185	0.445	1.000
16	Accomplish core business needs	0.058	0.324	0.228	0.108	0.385	0.075	0.034	0.412	0.299	0.305	0.303	0.295	0.306	0.269	0.591
17	Stakeholder needs and expectations	0.336	0.553	0.289	0.380	0.279	0.438	0.668	0.273	0.081	0.402	0.176	0.216	0.283	0.123	0.029
18	High profit margin	0.265	0.081	0.074	0.019	0.380	0.115	0.014	0.278	0.085	0.000	0.182	0.412	0.243	0.170	0.280
19	Excellent commissioning programmes	0.642	0.494	0.286	0.448	0.370	0.414	0.691	0.188	0.062	0.466	0.188	0.060	0.116	0.158	0.116
20	Early occupation	0.043	0.274	0.372	0.262	0.416	0.406	0.380	0.053	0.351	0.401	0.169	0.284	0.525	0.306	0.010
21	Corporate missions	0.387	0.105	0.090	0.222	0.407	0.209	0.059	0.041	0.151	0.257	0.258	0.093	0.067	0.059	0.134
22	Aesthetic value	0.372	0.193	0.332	0.282	0.165	0.137	0.055	0.106	0.042	0.132	0.114	0.144	0.324	0.213	0.126
23	Pleasant environment	0.321	0.026	0.068	0.166	0.503	0.115	0.024	0.296	0.204	0.055	0.528	0.486	0.367	0.264	0.313
24	Usable life expectancy	0.420	0.305	0.014	0.372	0.384	0.346	0.082	0.296	0.269	0.276	0.043	0.214	0.151	0.075	0.133
25	Excellent close-out process	0.386	0.044	0.102	0.015	0.307	0.020	0.271	0.054	0.360	0.008	0.324	0.050	0.089	0.031	0.159
26	Worthwhile warranty programme	0.328	0.026	0.327	0.159	0.621	0.043	0.117	0.299	0.184	0.147	0.187	0.132	0.416	0.600	0.758
27	Minimum cost of ownership	0.437	0.253	0.157	0.135	0.560	0.115	0.201	0.011	0.212	0.011	0.241	0.106	0.178	0.358	0.317
28	Flexible for future expansion	0.491	0.337	0.164	0.128	0.153	0.221	0.302	0.361	0.265	0.185	0.340	0.487	0.325	0.154	0.016
29	New market penetration	0.242	0.487	0.170	0.298	0.130	0.541	0.464	0.224	0.269	0.467	0.278	0.275	0.015	0.111	0.012
30	Lower depreciation cost	0.316	0.305	0.263	0.016	0.259	0.230	0.359	0.041	0.056	0.063	0.016	0.031	0.016	0.093	0.223

Table 10 (b): Factor grouping using Varimax rotation with Kaiser Normalization

		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
16.	Accomplish core business needs	1.000														
17.	Stakeholder needs and expectations	0.345	1.000													
18.	High profit margin	0.251	0.103	1.000												
19.	Excellent commissioning programmes	0.035	0.580	0.251	1.000											
20.	Early occupation	0.103	0.496	0.150	0.310	1.000										
21.	Corporate missions	0.291	0.071	0.423	0.485	0.102	1.000									
22.	Aesthetic value	0.042	0.302	0.144	0.168	0.252	0.400	1.000								
23.	Pleasant environment	0.325	0.178	0.135	0.367	0.217	0.369	0.188	1.000							
24.	Usable life expectancy	0.035	0.092	0.491	0.411	0.068	0.559	0.085	0.187	1.000						
25.	Excellent close-out process	0.145	0.277	0.250	0.528	0.265	0.365	0.273	0.415	0.061	1.000					
26.	Worthwhile warranty programme	0.611	0.025	0.448	0.263	0.242	0.228	0.024	0.413	0.257	0.216	1.000				
27.	Minimum cost of ownership	0.157	0.388	0.197	0.337	0.382	0.075	0.054	0.479	00.07	0.635	0.472	1.000			
28.	Flexible for future expansion	0.164	0.072	0.603	0.418	0.038	0.129	0.124	0.264	0.480	0.071	0.202	0.131	1.000		
29.	New market penetration	0.106	0.200	0.248	0.486	0.355	0.357	0.010	0.055	0.458	0.107	0.205	0.156	0.609	1.000	
30.	Lower depreciation cost	0.326	0.170	0.232	0.243	0.159	0.251	0.048	0.169	0.283	0.059	0.359	0.064	0.325	0.259	1.000

5.0 Summary and Conclusion

All respondents used for this study were senior staff of their organisations and majority (74.4%) of them engage in building and civil engineering works. Senior staff or organizations were expected to be more experienced and have reliable information about their respective organizations. Government organisation (67%) had the highest amount of turnover (N100-N250 million and over N250 million) and the clients (100%) had the lowest turnover (up to N25 million). This may be because the clients are not the constructors of the project which the government appears to be the largest investor. Also table 6 indicates that all the project success criteria considered were important or very important with significant mean differences which fall within 0.01 and 0.05.

Based on the findings of this study, it was concluded that all the project success criteria were important to the stakeholders but their relevance to construction projects differs. This is evident in the factor analysis which shows that all the project success criteria contribute to project success but some contribute more than the others. As a result of the varying contribution of the project success criteria, they were reduced to nine principal components and given names according to the factors they fit most.

It was also concluded that 'User-related' component is the most important project success criteria, followed by 'Professionals' related' component and 'Organizations' related components. Other components were equally important but their contributions to project success criteria were small. Therefore, they were termed 'Minor factor' component. It was observed that the criteria under the minor components (future business expansion, life expectancy, new market penetration, corporate mission, depreciation cost, pleasant environment, etc) relate to organizations and projects but they may not have been rated high by stakeholders if they are not of high importance to construction project success.

The Eigen values of all extracted components exceed 1.0 and all extracted components were able to explain 85.553% of the total variance of criteria. Component one (user related component) in this study is similar to component one of (1) and (19). Al-Tmeemy, et al. (2010) has project management success (Cost, quality and time) as their first component while customer satisfaction is the component one of (19). These authors corroborates the findings of this study because cost, time and quality are part of users' components in a case where the client is the user and user related factors is to make the customer satisfied. Takim and Adnan (2008) however had learning and exploitation as their first component and it contradicts this study because this study captures learning and exploitation under component two. Component 2 (Professionals components) is similar to component 1 (Learning and exploitation) of (20) while component 3 (organisational factors) corresponds with component 4 (operational assurance) of (20) and market success in (1). Component 4 (minor factors) takes care of other factors that are not as important as the factors in the first three components.

The correlation among the variables of each component is significant. For component 1, the variables involved are users' satisfaction on product, fitness for purpose, project functionality, value for money, meet pre state objectives and stakeholders need and expectation. For component 2, the variables involved were exploitation of technology, increase level of professionalism, fast rectification of defects, developing new knowledge and expertise, easy to maintain, benefits to end user and developing new business relationship. Component 3 is generate positive reputation, worthwhile warranty programme and accomplish core business needs. Component 4 is flexibility for future expansion, useable life expectancy and new market penetration and component 5 is minimum cost of ownership, excellent commissioning programmes, corporate mission, etc. All the variables were significantly correlated with one another because they all have values ranging from 0.55 to 0.76.

Therefore, the study concludes that there are basically four components upon which project success criteria can be based and they include user-related components, professionals' related components, organisation related components and other minor criteria components. The study also concludes from the result of the study that project success criteria goes beyond meeting cost, time and quality target. It includes users' satisfaction, professionals' fulfilment and achievement of organizational goals. The study recommends that for any substantial improvement to be made in the area of project success in Nigeria, attention must be paid to the criteria under users', professionals' and organizations' components. These criteria include user satisfaction, fitness of project for purpose, project functionality, value for money, meeting pre stated objectives, improved technology, increased professionalism, quick rectification of defects, etc.

References

[1] S. Al-Tmeemy, H. Abdul-Rahman, and Z. Harun, "Future Criteria for Success of Building Projects in Malaysia", International Journal of Project Management, 01226, pp. 1-12, 2010.

[2] R. Atkinson, "Project Management: Cost, Time and Quality, Two Best Guesses and a Phenomenon, its Time to Accept other Success Criteria", International Journal of Project Management, vol. 17 (6), pp. 337-342, 1999.

[3] D. Baccarini, "The logical framework method for defining project success", Project Management Journal, vol. 30 (4), pp. 25-32, 1999.

[4] E. Camilleri, "Project Success: Critical Factors and Behaviours", Accessed at www.gowerpublishing.com, on 15th March, 2012.
[5] P. C. Chan, "Framework for Measuring Success of Construction Projects", Report 2001-003-C-01
[6] T. Cooke-Davies, "The real success factors on projects", International Journal of Project Management, vol. 20 (3), pp. 185-190, 2001.
[7] T. Deacon, "The Elusive Concept of Project Success: Introducing the Endeavour Success Matrix", PM World Today, vol. 13 (10), pp. 1-10, 2011.
[8] A. Idrus, M. Sodangi, and M. H. Husin, "Prioritizing Project Performance Criteria with Client perspective", Research Journal of Applied Sciences, Engineering and Technology, vol. 3 (10), pp. 1142-1151, 2011.
[9] K. Kendra, and L. J. Taplin, "Project Success: A Cultural Framework", Project Management Journal, vol. 35 (1), pp. 30-45, 2004.
[10] R. G. Koelmans, "Project Success and Performance Evaluation", International Platinum Conference 'Platinum Adding Value', The South African Institute of Mining and metallurgy, 2004.
[11] A. L. Ika, "Project Success as a Topic in Project Management Journals", Project Management Journal, vol. 40 (4), pp. 6-19, 2009.
[12] Microsoft Encarta, Microsoft Encarta Premium. Microsoft Corporation, 2009
[13] D.C. Murphy, N. Baker, and D. Fisher, "Determinants of project success", National Aeronautics and Space Administration, Boston, 1974.
[14] R. R. Nelson, "Project Retrospectives: Evaluating Project Success, Failure, and everything in between", MIS Quarterly Executive, vol. 4 (3), pp. 361-372, 2005.
[15] J. NIU, G.L. Thomas, and J. Jiang, "Success Criteria Framework for Real Estate Project", Management Science and Engineering, vol. 4 (3), pp. 10-23, 2010.
[16] M. K. Pariff, and V. E. Sanvido, "Checklists of critical success factors for building projects", Journal of Management in Engineering, vol. 9 (3), pp. 243-248, 1993.
[17] M. Saqib, R. U. Farooqui, and S. H. Lodi, "Assessment of Critical Success Factors for Construction Projects in Pakistan", First International Conference on Construction in Developing Countries (ICCIDC-I) 'Advancing and Integrating construction education, Research and Practice' August 4-5, 2008, Karachi, Pakistan, 2008.
[18] A. J. Shenhar, and R. M. Wideman, "Improving Project Management: Linking Success Criteria to Project Type", A Paper Presented to the Southern Alberta Chapter, Project Management Institute, Symposium 'Creating Canadian Advantage through Project Management' Calgary, Canada, 2001.
[19] A. J. Shenhar, O. Levy, and D. Dvir, "Mapping the Dimensions of Project Success," The Professional Journal of the Project Management Institute, vol. 28 (2), pp. 4-13, 1997
[20] R. Takim, and H. Adnan, "Analysis of Effectiveness Measures of Construction Project Success in Malaysia", Asian Social Science, vol. 4 (7), pp. 74-91, 2008
[21] R. Takim, and A. Akintoye, Performance Indicators for Successful Construction Project Performance. In: Greenwood, D (Ed.), 18th Annual ARCOM Conference, 2-4 Septermber, 2002, University of Northumbria. Association of Researchers in Construction Management, vol. 2, pp. 545-555, 2002.