

# Stakeholder's Perception of Critical Success Factors for Design-Bid-Build Highway Projects in Nigeria

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**ABSTRACT:** Project success factors are germane in achieving project objectives by stakeholders. The research investigates the stakeholder's perception of project success factors for highway project in Nigeria. Therefore, the specific objectives is to identify and assess factor influencing the success of highway project in Nigeria. To achieve the main objective of this paper, two hundred (200) questionnaires were administered on major stakeholders in the highway sector; comprising highway engineers both in consultancy firms and client organisations, and quantity surveyors using random sampling technique. Ninety-four (94) questionnaires were found useful for the analysis, yielding a response rate of 47%. Statistical Package for Social Sciences (IBM SPSS Version 22) was used in analysing the data. The results indicated that clear project goals (4.68), experienced design team (4.59), proper project planning (4.51), availability and adequacy of resources (4.50) and on time decision making (4.48) in that order are the most CSFs in highway projects in Nigeria. However, a Kruskal-Wallis test conducted showed that there is no statistically significant difference in the ranking scores among the three (3) stakeholders at 5% significance level, except for four out of the twenty two factors assessed. The group means vary slightly from the individual means obtained from different stakeholders but there is no significant difference in the means. The slight variation is due to the difference in opinions of the stakeholders as each group has priority for different project objectives. The paper concluded that these CSFs need to be given serious attention if the issues of cost and time overrun, project abandonment and litigation have to be a thing of the past in the Nigerian construction industry.

**KEYWORDS:** Critical success factors, highways, construction projects

## 1. Introduction

Any nation's ability to flourish economically and socially depends on its construction sector. Numerous variables affect how well a project performs and can result in a successful construction project. According to [1], there are specific factors, referred to as "critical success factors" that are more crucial than others in construction projects. [2], referenced in [3] defined critical success factors (CSFs) as "the few primary areas of activity in which favourable results are obviously obligatory for a particular management to attain his or her goals". According to [3], CSFs directly affect cost, time, quality, and safety, which are the primary metrics used to determine a project's success.

CSFs are useful when making key decisions. Hence, ranking the CSFs of projects is significant. The majority of highway construction projects in Nigeria are plagued by

a variety of issues, including insecurity, cost overruns, quality issues, and delays [4]-[6]. Many road contractors, whether working for small local businesses or government agencies, have underperformed or failed to complete their assignments, especially when it comes to road maintenance [7]-[9]. The government's attention was drawn to the criticism of their work, which compelled it to create performance contracts and even establish the authority to monitor the contractors' "performance."

However, the poor performance of the road contracts is due to poor management of funds and poor delivery of services to the road user. In addition, performance measurement systems are not effective or efficient to overcome this problem. This measure put in place by government has not really brought about the desired result in achieving project objectives. There is need to look at the critical success factors which have significant impact on project objectives. Therefore, the aim of this

research is to identify and rank CSFs of highway construction projects in the Nigerian construction industry with a view to improving DBB highway projects in Nigeria.

## 2. Literature Review

### 2.1. Critical Success Factors

There has been a lot of literature on the subject of CSFs [10]. Many authors have utilized it in a general way for all projects [11-14], but others have used it specifically for each project. According to [12], the CSFs were derived in various investigations using general conceptual criteria. Other authors, according to [11], employed particular execution techniques. They added that the majority of the earlier research had mostly only identified the CSFs for project success in general. Few studies, according to [13] and [14], have identified the CSFs of public construction projects. However, there have been significant building projects that have included CSFs. Furthermore, CSFs in projects carried out by public-private partnerships were identified by [15]. For different people, success has varying degrees of significance and power.

Furthermore, CSFs might alter over time and among various nations. Additionally, it is significantly impacted by the nature, size, and participants on the project. As a result, it is quite difficult to establish a definite and consistent notion for these components. For all scholars who are concerned with the growth of the construction sector, the study of these issues is still crucial despite this. The DBB projects that served as the basis for the CSFs in this study were not given substantial consideration in Nigeria as previous researches were generic and not project specific [16, 17]. The literature and the opinions of specialists were used to create the CSFs for this investigation. Lists of CSFs and authors are included in Table 1.

### 2.2. Design and Build Highway Projects.

The most frequently used and least risky is the Design-bid-build (DBB) procurement method among all the conventional approaches, provided the model is well implemented [18, 19]. DBB is the traditional method of project delivery which has been widely used for procuring highway projects in Nigeria [19]. It is a linear process where one task follows completion of another with no overlap. It commences with the client (Government) selecting an engineering firm to carry out the design and prepare documents for the highway. Contractors are then invited to bid for the construction of the project as designed and the lowest responsible, responsive bidder is awarded the job. DBB has its own shortcomings. The main criticism is conflict and adversarial relationship, delayed completion, cost

overrun, poor buildability, multiple point responsibility, lack of innovation and that owners bear large proportion of risks in design and construction [19]. Design and Build procurement approach gives way to a single contractor, solely, the responsibility to design and construct the project. Though, DBB procurement method is capable of reducing fragmentation at project level between contractual partners. Therefore, it subjects both clients and contractors to greater risks due to low level of design at the time of contract award [20, 21].

### 2.3. Highway Project Development in Nigeria

Despite enormous potential in human and material resources in Nigeria, the country is yet to harness the resources available to its full potential. This has affected the growth of the economy. The country is still suffering from inadequate provision of highways. The road density in Nigeria is currently 0.206km/km<sup>2</sup> compared to 0.212km/km<sup>2</sup> in 2014, a large proportion of which are unpaved [22].

Highway infrastructural provision in developing countries are found to be insubstantial, majority of which are not accessible for all weather [19]. Majority are unpaved and those paved are not properly maintained. This has been a major concern for government and all stakeholders in the sector. Tables 2 summarizes the highway infrastructure conditions in selected African countries for the period between 2010 and 2021.

The road density as seen in Table 2 indicated that African countries have the lowest total road density of 0.26km/km<sup>2</sup> and an average paved density of 0.06km/km<sup>2</sup>. This is low compared to other parts of the globe, especially Europe with total road density 1.320km/km<sup>2</sup> and an average paved density of 1.120km/km<sup>2</sup> [19]. The neglect of the rail system and excessive pressure on the existing highways causes a lot of damages which make them deplorable. In [19], the author stated that one-third of existing highways in Sub-Sahara Africa is lost to overloaded and aging vehicles and trucks. The bad state of highways in Nigeria is responsible for high cost of transportation, and the multiplier effect of which is reflected on the cost of goods and services [23]. Hence, these CSFs must be evaluated to ensure that our highways are put in proper shape.

## 3. Research Methods

This study essentially employed the use of descriptive survey techniques and quantitative research design using the questionnaire method. This paper involved the use of pilot studies to ensure clarity and relevance of the drafted questionnaire.

Table 1: Critical success Factors and Authors

S/N	CSFs	Authors
1.	Adequate security for workers	Developed
2.	Experience design team	[12]
3.	Correct estimate of project cost	[12]
4.	Effective scheduling and time control system and frequency of project schedule updates	[12]
5.	Experienced Project Management	[12]
6.	Commitment of all parties to the project	[12]
7.	Perception of the role and responsibility	[12]
8.	Proper project planning	[13]
9.	Preparing clear quantity take-off	[13]
10.	Connect the contract price with the price index	[13]
11.	Managerial and organizational skills	[13]
12.	Utilization of Advanced technology	[14]
13.	Creating accountabilities, experiences, roles and responsibilities for the organization	[14]
14.	Allow sufficient time for feasibility studies, design, drawings and tender preparation	[15]
15.	Effective site management	[24]
16.	Implementing an effective quality control and assurance systems	[24]
17.	Experienced subcontractors	[24]
18.	Effective communication and coordination	[25]
19.	Preparing adequate and comprehensive specifications	[25]
20.	Competitive procurement process	[25]
21.	Competitive procurement process	[25]
22.	Implementation of safety management system	[29]
23.	Regular equipment maintenance	[31]
24.	Allocating appropriate fund	[32]
25.	Effective quality control system	[12], [24]
26.	Clearing right of way obstructions before mobilization of contracting company to the site	[9], [27]
27.	On time decision making	[10], [27]
28.	Proper dispute resolution clauses incorporated in the contract	[14], [25]
29.	Implementing an effective safety program	[13], [34]
30.	Clear project goals	[24], [25]
31.	Frequent meetings among various stakeholder to evaluate the overall performance and reports update	[14], [35]
32.	Availability of resources (human, financial, raw materials and facilities)	[24], [26]
33.	Developing positive friendly relationships with the project stakeholders	[14], [36]
34.	Fast troubleshooting capabilities	[25], [26]
35.	Equipment availability	[24], [28]

Table 2: Highway Infrastructure conditions in Major African Countries, 2010-2021

Countries	Total Road Length	Length of Paved Road	% of Paved Road	Land Surface Area ('000)	Total Road Density	Paved Road Density
Morocco	58,395km	41,116km	71.00	444	0.132	0.093
Kenya	160,886km	11, 187km	07.00	569	0.283	0.019
Nigeria	200,200km	75, 000km	38.90	923	0.206	0.077

Ghana	109,515km	13, 787km	12.59	228	0.480	0.059
Egypt	65,050km	48, 000km	73.80	996	0.065	0.048
Cameroon	121, 501km	7, 252km	05.97	473	0.257	0.015
South Africa	750, 000km	158, 952km	21.00	1, 213	0.618	0.131
Algeria	127,000km	98, 213km	77.30	2, 737	0.048	0.038
Average					0.261	0.06

Source: Central Intelligence Agency (2014), Knoema (2021)

The drafted questionnaire was shown to six professionals in the research field to review. Three questionnaire were administered on professionals who are university lecturers not below the rank of senior lecturers and others are practising professionals. Amendments were made on the drafted questionnaire based on suggestions of the reviewers. This was concluded before the final questionnaires were administered to the respondents. This study population is made up of civil engineers, quantity surveyors and client organisations (government) in Lagos and Ogun State, Nigeria. The sample size was obtained using the Krejcie Morgan formulae, having obtained the population from the Federation of Construction Industry (FOCI) and respective professional institutes of the professionals. A sample size of 210 was obtained. The questionnaires were generated using the responses obtained from the group of professionals in the construction industry for the purpose of data collections. The respondents to the questionnaire are the practitioners in the construction industry within Lagos and Ogun state. This method of data collection is significant as it helps in the collection of first-hand information from the direct personnel involved in the subject matter of this research. The questionnaire contains two sections: section A which contains questions that helps to identify the respondents and their relevance to the study together with their level of experience; and Section B which which consists of questions on the critical success factors of DBB highway projects in Nigeria. It contained a table of critical success factors of DBB highway projects in which the experts were requested to tick their opinions based on their experience in the industry. 35 critical success factors in all, 34 derived from literatures and one developed by the authors and verified by the experts in the pilot studies were presented in the table.

Using five point Likert scale questionnaire survey, the respondents were asked to indicate their perceived level of criticality for each of the identified CSFs by selecting any of the five evaluation scales; "Highly critical"(5),

"Critical"(4), "Somewhat critical"; "Rarely critical" (2); "Not critical" (1). The questionnaires were administered to respondents by the researcher. The purpose of the research was explained to the respondents to gain their consent and assurance was given of the confidentiality of their response and protection of their identities. The data collected was subjected to statistical analysis using Statistical Packages for Social Science (SPSS IBM Version 22). The descriptive statistics of simple percentage and mean were used in presenting the analysed data.

#### 4. Results

Table 3 shows the socio-economic characteristics of the respondents. Items 1 show respondents' type of establishment. The result of the analysis depicts that 31.9% of the respondent are client, 29.8% are consulting while 38.3% are contracting. Items 2 in the table show respondents' profession. The result of the analysis depicts that 61.7% of the respondents are civil engineer, while 38.3% are quantity surveyor. Items 3 in the table shows respondents' field of specialization. The result of the analysis depict that 46.8% of the respondents are into new work, 6.4% are maintenance work, 29.8% are civil engineering works while 17% are building/civil engineering. Items 4 in the table show respondents' academic background. The result of the analysis depicts that 30.8% of the respondents are HND, 31.9% are B.Sc., 33% are M.Sc while 4.3% are Phd holders. Items 5 in the table show respondents' work experience. The result of the analysis depict that 23.4% of the respondents are between 1-5 years of work experience, 14.9% are between 6-10 years of work experience, 54.3% are between 11-15 years of work experience while 7.4% are between 16-20years of work experience. Item 6 on the table shows the respondents' profession qualification. The result of the analysis depicts that 38.3% of the respondents are NIQS/RICS while 61.7% are NSE/COREN. This implies that majority of the respondent are NSE/COREN. The demographic information shows that the respondents

have adequate and requisite experience to have participated in the research.

#### 4.1. Discussion of the results

This paper evaluates the critical success factors of Design-Bid-Build highway projects in Nigeria. Table 4 shows the responses of the respondents on critical success factors (CSFs) of DBB highway projects in Nigeria. The first rank on CSFs is "clear project goals" with mean score (4.88). This is followed by "experienced design team" with group mean score (4.63). The third ranked CSF is "proper project planning with group mean score (4.58). The next two factors ranked are "availability and adequacy of materials" (4.46) and "on time decision making (4.41) respectively. The least critical success factor is "allocating appropriate fund" with group mean score (3.51). The mean scores obtained for each of the stakeholder vary slightly due to individual interest to be protected by each. For example, the contractor has the highest individual mean score for "proper project planning" (4.66) as against consultant (4.64) and client (4.44). However, for on time decision making, the client has the highest mean score (4.56) while the consultants and contractors have (4.34) and (4.33) respectively. The point here is that each stakeholders have interest to protect. One novel result of this research is the establishment of the factor "Adequate security for the workers" (3.90) as one of the critical success factors in the Nigerian highway construction subsector. The huge some being demanded by kidnapers and bandits is detrimental to the success of the industry because construction as a business to contractor has a margin of profit. It is becoming a norm in the country that security operatives are attached to companies executing highway projects in Nigeria. These findings are in agreement with the studies of [10], [14], [26], [27], [35], [25], [24], [30] and [8]. In all these studies, though, the mean scores obtained by previous studies vary slightly, these same factors were considered critical. The reasons for the slight difference in the results could be attributed to the fact that while some of the previous authors worked on PPP projects, some worked on generic projects, and few on D&B projects. This result obtained for the 22 critical success factors is high on a scale of 5. The study adapted [37] scale i.e. <1.50 = Not critical, 1.50-2.49 = less critical, 2.50-3.49 = somewhat critical, 3.50-4.49 = critical and  $\geq 4.50$  = highly critical. Hence, out of the 35 factors evaluated, 22 factors were found to be critical for DBB highway projects in Nigeria. The problems with underperformance of highway projects are due to these critical success factors. The 22 critical success factors obtained in this paper are so

important if a success is to be achieved in the highway subsector of the Nigerian economy. If the highway sector is well developed, it has a significant impact on the economy. The man-hour loss due to traffic will be reduced, transport fare will be reduced and the menace of kidnapping especially in the bad spots on our highways will be reduced.

Kruskal-Wallis test was carried out to compare the medians of the samples of the three stakeholders that participated in the survey. The result showed that there is no statistically significant difference in the perceptions of respondents on the critical success factors of DBB highway projects in Nigeria except for four factors (see Table 4). The four CSFs are; experience design team, correct estimate of the project, adequate security for workers and effective site management. The p-values for these 4 factors are less than 0.05 (see Table 4). The reasons for the difference in the results could be attributed to the fact that each of the stakeholders has different and diverse interests to protect. While the client will have special interest to ensure a workable design in terms of aesthetics is put in place, the contractor is looking at the buildability and profit to be made in the organization and the quantity surveyor is looking at the cost management to ensure that there is value for money on the projects being executed.

#### 5. Conclusion and Recommendation

This study investigated stakeholders' perception of critical success factors for DBB highway projects in Nigeria. Clear project goals is very important as this will make the project faster as all the stakeholders know what to do at the appropriate time. Experienced design team is also highly essential as a critical success factors. This helps in the translation of clients' briefs into desired outcomes. Proper project planning as well as making materials needed in construction of highways is key to achieving success in highway construction. Based on the ranking analysis above, twenty-two factors were considered critical out of the thirty-five factors that were evaluated. The ranking by each of the stakeholders was based on the interest to be protected by each of them. The factors that are directly related with execution of project have highest mean scores from the contractors while those related with management of the highway projects have high mean scores from the clients and consultants. Adequate security for workers which was not found in the literature is very important in the Nigerian context as this could affect performance of highway projects. Also, these established CSFs will help to minimize the probability of uncompleted

Table 3: Analysis of the Socio-Economic Characteristics of the Respondents

SN	Items	Frequency	Percentage	
1	Type of Establishment	Client	30	31.9
		Consulting	28	29.8
		Contracting	36	38.3
		<i>Total</i>	<i>94</i>	<i>100</i>
2	Profession	Civil Engineer	58	61.7
		Quantity Surveyor	36	38.3
		<i>Total</i>	<i>94</i>	<i>100</i>
3	Field of specialization	New work	44	46.8
		Maintenance work	6	6.4
		Civil Engineering works	28	29.8
		Building/Civil Engineering	16	17.0
<i>Total</i>	<i>94</i>	<i>100</i>		
4	Academy Qualification	HND	29	30.8
		B.Sc.	30	31.9
		M.Sc	31	33.0
		PhD	04	4.3
		<i>Total</i>	<i>94</i>	<i>100</i>
5	Working Experience	1-5	22	23.4
		6-10	14	14.9
		11-15	51	54.3
		16-20	7	7.4
		<i>Total</i>	<i>94</i>	<i>100</i>
6	Professional Qualification	NIQS/RICS	36	38.3
		NSE/COREN	58	61.7
		<i>Total</i>	<i>94</i>	<i>100</i>

Source: Field Survey, 2021

Table 4: Ranking responses on Project Critical Success Factors

SN	Ranking responds on Critical Project Success Factors	Client	Consultant	Contractors	Total			RL
		N=30	N=28	N=36	N=94			
		Mean	Mean	Mean	GM	Chi-Square Value	Kruskal-Wallis Asymp. Sig. p	
1.	Clear project goals	4.89	4.88	4.87	4.88	1.214	.714	1 <sup>st</sup>
2.	Experience design team	4.54	4.59	4.76	4.63	15.496	.0042**	2 <sup>nd</sup>
3.	Proper project planning	4.44	4.64	4.66	4.58	5.897	.421	3 <sup>rd</sup>
4.	Availability and adequacy of materials	4.41	4.45	4.52	4.46	3.935	.623	4 <sup>th</sup>
5.	On time decision making	4.56	4.34	4.33	4.41	6.762	.324	5 <sup>th</sup>
6.	Utilization of Advanced technology	4.27	4.29	4.40	4.32	5.277	.489	6 <sup>th</sup>
7	Correct estimate of project cost	4.12	4.25	4.29	4.22	13.382	.0025**	7 <sup>th</sup>
8	Preparing adequate and comprehensive specifications	4.14	4.21	4.16	4.17	2.462	.786	8 <sup>th</sup>
9	Effective communication and coordination	4.10	4.14	4.21	4.15	3.713	.613	9 <sup>th</sup>
10	Equipment availability	4.04	4.03	4.05	4.04	2.532	.781	10 <sup>th</sup>
11	Regular equipment maintenance	4.01	4.00	4.05	4.02	2.641	.762	11 <sup>th</sup>
12	Use of environment friendly equipment	4.02	4.01	3.97	4.00	2.246	.934	12 <sup>th</sup>
13	Experienced sub-contractors	3.98	3.93	3.97	3.96	6.624	.325	13 <sup>th</sup>

SN	Ranking responds on Critical Project Success Factors	Client	Consultant	Contractors	Total			RL
		N	N	N	N			
		Mean	Mean	Mean	GM	Chi-Square Value	Kruskal-Wallis Asymp. Sig. p	
14	Implementation of safety management system	3.85	3.99	3.86	3.90	2.405	.907	14 <sup>th</sup>
15	Adequate security for workers	3.87	3.84	3.99	3.90	12.496	.039**	14 <sup>th</sup>
16	Competitive procurement process	3.88	3.89	3.81	3.86	7.681	.247	16 <sup>th</sup>
17	Experienced Project Management	3.79	3.88	3.85	3.84	3.072	.649	17 <sup>th</sup>
18	Commitment of all parties to the project	3.76	3.80	3.78	3.78	8.512	.109	18 <sup>th</sup>
19	Effective site management	3.69	3.72	3.78	3.73	14.277	.013**	19 <sup>th</sup>
20	Effective quality control system	3.63	3.72	3.60	3.65	2.892	.853	20 <sup>th</sup>
21	Experienced subcontractors	3.51	3.62	3.61	3.58	4.359	.598	21 <sup>st</sup>
22	Allocating appropriate fund	3.38	3.58	3.57	3.51	3.561	.623	22 <sup>nd</sup>

Source: Field Survey 2021. GM=Group Mean N=Number of Frequency RL= Rank Level



highways projects. Project delays and subsequent abandonment will be drastically reduced if stakeholder management on highway is holistically given utmost attention due to diverse interest to be protected in construction.

### 5.1. Recommendation

Based on the findings of this study, the following recommendations are made.

- Federal government should urgently look into these critical success factors to restore highway projects for the betterment of the people living in this environment.
- Highway agencies should embrace project stakeholders because their experiences will influence the projects and consequently affect project success.
- A comprehensive stakeholder analysis will help to identify and track the expectations and needs of the individuals or groups to improve the performance and success of the project.
- There should be adequate security for personnel involved in highway projects because issues of kidnapping has become rampant as the workers are the main target of these dare devil men.

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