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Determination of the Influence of Project Planning on the Performance of Road Construction Project

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Abstract: The importance of road to man cannot be overemphasized. This is because road is one of the basic infrastructures to man. Effective project planning enhances its performance in terms of meeting the set objectives is very critical for any project. The aim of this study was to determine the influence of project planning on the performance of road construction. Data for the research was sourced through questionnaires, direct observation and Oral interview. The collected data was analyzed using percentages, regression tools in Eview8. The results were presented in pie charts and tables. The results from the findings show that 38.8% of the respondents strongly agreed to the fact that performance of road construction is greatly influenced by proper project planning, 42% agreed, 9.6% disagreed and 9.2% strongly disagreed. The regression result of the response had R^2 of 0.555 and the P-Value was less than 0.05 which means that about 55.5% of road project performance is as a result of proper project planning. The finding summarized that high quality road construction can be used effectively in improving the road construction sector and improve the economy It was recommended that road construction firms should undergo proper checking on all levels of planning to improve performance of road projects.

Keywords: Performance, Planning, Project, Road Construction

1. Introduction

The importance of road to man cannot be overstated. This is because road is one of the basic infrastructures to man. Roads are the arteries through which the economy pulses. By linking producers to markets, workers to jobs, students to school, and the sick to hospitals, roads are vital to any development agenda [13]. Roads make a crucial contribution to economic development and growth and bring important social benefits. Roads open up more areas and stimulate economic and social development. For those reasons, road infrastructure is the most important of all public assets [35]. It is important that the contractors accomplish projects timely, within cost and as per required quality [1]. Road infrastructure projects play a major role in economies world over. It remains the major means of transportation in Africa, covering about 75% of freight and passengers [14]. Road infrastructure projects are massive investments undertaken to support the prosperity of any country through haulage of goods and services from one place to the other [29]. In Sub-Sahara Africa, road infrastructure presently remains the means of conveying about 75% of freights and passengers [36] considering that about 50% of the roads in the Sub-Sahara region are yet to be constructed implies that road infrastructure development remains on the top list of physical infrastructure developments in such cities, potentially impacting the socio-economic and physical environment of the cities and their peri-urban areas [29].

In addition, road infrastructural development has simultaneously promoted the accessibility to workplace, schools, hospitals and commercial centers [47]. They were also seen to have the power to promote interactions among residents, especially those who are engaged in commerce [16]. Good infrastructural enhances prompt service delivery, improves lives, increase working capital, internal generated revenue (IGR) and nation's gross domestic products (GDP). The Nigerian construction industry has witnessed significant

growth since 2011, The contribution to GDP is 1.4 % [43].

The success of any road construction depends on some critical factors. Critical success factors are those fundamental issues vital to the current operating activities and future success of an organization [23]. This implies that critical success factor can predict and improve the effectiveness of a road project. The determinant of success in the construction industry has been project based where cost, time and quality underscore the parameters. There are a number of factors that inhibit successful implementation of road construction in developing countries as observed [30]. It is therefore in the best interest of the project management to address the critical factors that influence completion of road construction projects.

An appreciation of the critical factors that influence performance of a project is therefore imperative so as to provide project managers with an idea regarding where to lay focus on [50]. For productive construction industry, project success is essential [21]. Project success can therefore be defined as "When a project achieves more results than the excepted or normally obtained in terms of quality, cost, time, and safety measures" [50].

Majority of the construction projects in Nigeria experience delays which in turn lead to disputes, arbitration, litigation and sometimes the total abandonment of the project [11]. Several construction projects do not complete within the planned budget, within the stipulated schedules and failing to meet the desired quality due to factors such as time inefficiency, inadequate funds, lack of advance implementation equipment [34]. These challenges have made life difficult for road users and slow the uptake of road construction projects. Failure of these construction projects will result in reduced supply of quality roads as well as a less vibrant economy which consequently contributes to a lower standard of living for residents as well as increased unemployment in the County [6].

2. The Concepts of Critical Success Factors

The concept of "success factors" was coined in 1961 by D. Ronald Daniel of McKinsey & Company, it was refined into critical success factors in 1981 by John F Rockart, since then many authors have published lists of critical success factors [CSFs] [18]. Critical success factors are the few key variables or factors that the manager should prioritize in other to achieve his/her goals for current or future areas of activity [7]. Critical success factors are inputs to project management practice which can lead directly or indirectly to project success [51]. Effective and efficient management of critical success factors is the basic requirement of project success [26]. Twenty-six critical success factors in construction projects were identified as stated [19].

There are several success criteria that have been studied in order to state the issue of project success the previous decades. A criterion can be defined as "the principle or standard by which something can be judged or decided" [2]. Project success criteria are the variables which measures success [52]. Many researchers suggest that success cannot be accessed only through these three criteria since project success is more complex [30]. Along the same line, current project management guides, such as PMBOK [PMI, 2013], still place an emphasis on the delivery of projects within the constraint of time, cost and scope also referred to as the iron triangle [61]. More specifically, project objectives will tend to be either qualitative and not easily measured in any objective manner, or longer-term and not are easy to criteria quantitatively measurable immediately, on the contrary project management objectives that are cost, time and quality that is the point at which project management ends. This leads to a reference the project management criteria being a subset of all project criteria.

Although success criteria and success factors in general are different in nature, the two issues are highly interconnected [18]. Conventional success measures or the so-called iron triangle of time, cost, and quality to be the leading performance indicator in construction projects were emphasized [6]. Project success criteria differ from project to project that there is no standard set of procedures that can be applied to all industry fields at all times. Six critical success factors of the public-sector construction project in Owerri, Imo State of Nigeria were identified [7]. In the same vein twelve critical success factors and thirteen critical failure factors in construction projects were identified [2]. As one of the first studies in its kind [12] proposed a set of CSFs for integration of sustainability into project management practices on construction projects. Wang, N. et al. [62] identified eleven critical factors for sustainable project management. Further research [32] classified critical success factors into five groups: factors related to the company, factors related to the project management, factors related to the project manager and project team, factors related to the contractor and factors related to the environment. [How many CSF [Total]? We think more than 80, for sure there are many similar CSFs, but if we will state all it, it will be extra information and too long paper].

3. The Concepts of Project Success

A project is considered successful when the expected outcomes are of the predetermined standards, sustainable, achieved within the stipulated time and come under the umbrella of the preliminary budget. Moreover, success is a multidimensional concept that ensures project efficiency, organizational and business success, customer satisfaction, and preparing for the [33]. Success in projects enhances the social, economic, and environmental wellbeing of various stakeholders involved [27]. Additionally, it is believed that every 1% of government investment in infrastructure developmental projects will cause an increase in the gross domestic product [GDP] equivalent to 1% [35]. It is important to differentiate between project success and project management success. Silva, Tomal, D. R. & Jones, K. J. [58]

noted that there is no such thing as an absolute success in a project and there is only perceived success. The measuring of the project success is a complex task since the success is intangible and hardly be agreed upon [2].

On the other hand, micro viewpoint of a project, success considers project achievement in smaller component levels [44]. The results show that 48% of the professionals surveyed believed that project success is indeed projected management success while 52% of respondents indicated that they are totally different. We can say that the concept of project success has still ambiguous in the minds of professionals.

In the past years the simple definition for the success of the project was only based on the implementation phase of the project lifecycle; but in these days the definition of the project success is required from the beginning till the end of the project and product life cycles [26].

Achieving project success has been a domain of increasing interest in the project management literature. Despite this, many researchers admit that to achieve project success is still a challenging task. Simpson, J. [54], propose two constituents of project success: determining success criteria and critical success factors [CSFs]. Both of these are needed for enhancing the likelihood of project success within the dynamic project environment [59].

4. The Concepts of Project Performance

Performance is a critical concern and the success of the construction projects will face several challenges during project delivery [22]. Projects are often used as a way to reach the organization's strategic plan through the project team in the organization or the service production [33]. Performance is the sum of the outputs of an organization's work procedures and activities. It is concerned with how successfully an organization converts inputs into outputs and includes the actual results as compared to the desired outputs [19]. Desai, M. [15] views project performance as achievement of multiple and usually conflicting project objectives in terms of output, quality and cost. Therefore, project performance involves implementation and review of a project with a main objective of ensuring successful completion within the budgeted time, applying the resources expected as well as achieving the intended results. A project is considered successful when it has achieved technical performance specifications, fulfilled its goal and satisfied the stakeholder's expectations on the project outcome [41]. Their study further posited time, cost [budget], quality and management as Critical Success Factors [CSFs] of a project. In their study, [57] concluded that a project can be successful if it is finished in time, achieved project budget, conformed with set standards, satisfied stakeholders, environmental health as well as safety conformity, brings value for money, client and user satisfaction all which can be achieved though the effective utilization of monitoring and evaluation practices.

Tomal, D. R. & Jones, K. J. [58] see "organizational performance as the actual results or output of an organization as measured against that organization's intended outputs" p. 2. Organization performance is a general structure which refers to the operations of enterprise [32]. Organizational performance is a picture of the work of the organization in achieving goals that of course will be influenced by resources owned by the organization [4]. The resources in question can be physical such as human and non-physical resources such as regulations, information, and policies, to better understand the factors that can affect an organization's performance. Project could be regarded as a scheme, which is vigorous and keeps on changing from one stage to another within a life cycle [10]. Regarding a generic project, its status changes from that of a concept or an idea through to studies of feasibility, execution and lastly completion. In addition, projects are recently far more complicated than ever before. As an entity's objectives are volatile, controversial and contradictory performance is a subjective phenomenon [25]. Performance has been the most important issue for profit and non-profit organization [9]. The performance of parties, resource availability, environmental conditions, and contractual relations contribute to construction performance [3]. Success as the degree to which project goals and expectations are met; as also meeting the required expectation of the stakeholders and achieving its intended purpose [20, 28]. Success can also be defined as performance with respect to budget, schedule, and quality [8]. Project quality are evaluated by performance measurement which can be defined as the process of evaluating performance relative to a success in terms of time, cost and quality these are the basic criteria to project success while project creates productive assets through the conversion of resources into productive assets, for the right quality, time and cost [39]. Project performance criteria for construction projects were according to the attributes of construction projects [42]:

1) Meeting project's overall performance includes: Time, Cost, Quality
2) Meeting owner's requirements
3) Meeting project's multiple goals Includes: Health and safety and environment, Absence of conflicts, Risks management, Claim management
4) Stakeholders' satisfaction Includes: Owner's satisfaction, Project team's satisfaction, End-user's satisfaction; Suppliers' satisfaction; other stakeholders' satisfaction.

5. The Concepts of Project Planning

Effective planning is another important factor for road projects' success, taking into account the high investment done in the early stages of the project, their constraints, and uncertainties, and the different interests of the project's stakeholders [17]. Project planning is a process that specifies the responsible people to the action, the process, the times and the resources involved for a particular job in the mind and the author asserts that the project planning phase forms the basis for the next phase which is the execution or implementation phase [40]. Project implementation calls for

hiring the right skills, training some of the people without necessary skills, assigning responsibilities, and establishing performance standards as well as the reporting process [55]. Planning involves formulation of a number of alternative realistic work plans for achieving specified objectives and finally selecting a plan which is best suited from the stand-point of available resources and constraints imposed upon the project [36]. Whang, S. et al. [60] Planning of a project plan represents a managerial promise to seek after activities' arrangement in the development of the business, pulling in and client satisfaction, contending efficiently, leading tasks and improving financial and market performance of the company [60]. Therefore, some of the construction company's project plan entails growing the business, building a loyal clientele and outcompeting the rivals. The project planning choices a company makes are not often easy decisions and some of them might turn out to be wrong but that is not an excuse for not deciding on a concrete course of action [5]. Kress, A. O. [31], noted that all projects should endeavor to satisfy the three aspects of a project. However, external forces at play force the project to go off course. It is therefore necessary to perform proper planning since projects are capital intensive and carry along many risks and uncertainties with them [56]. A properly planned project typically has control mechanism that are inbuilt to make sure that all necessary procedures are followed to enhance the success of the project based on the set plan [38]. Planning process is the defining and refining of project objectives and the selection of the best alternatives to achieve these objectives [49]. The purpose of project planning is to develop a guideline for the project with sufficient detail to inform the project team about the necessary work packages that have to be executed and when the work has to be done, as well as keeping track of the overall progress of the project and maintaining the record of the project for future use. Furthermore, the purpose of project planning is to determine that the plan is realistic and that planning involves processes that will convert the "should be done work packages" into tasks that can be completed [23]. Recommendations related to project planning issues and associated with the project's designer/consultant are: a] implementing of the Last Planner System [LPS] or any other project planning tool; b] assessing the availability of resources and restrictions for construction activities c] allocating sufficient time and effort for planning, design, and documentation and d] implementing of digital simulations such as BIM to support planning activities [23].

6. Road Construction in the Republic of Nigeria

Nigeria has the largest road network in West Africa and the second largest south of the Sahara, with roughly 108,000 km of surfaced roads in 1990. However, they are poorly maintained and are often cited as a cause for the country's high rate of road fatalities. In 2004 Nigeria's Federal Roads Maintenance Agency [FERMA] began to patch the 32,000 kilometer federal roads network, and in 2005 FERMA initiated a more substantial rehabilitation. The rainy season and poor equipment pose challenges to road maintenance.

7. Institutional Theory by William Richard Scott [1995]

The institutional theory was developed by William Richard Scott in 1995. The theory posited that the need for organizations to have processes and procedures that guide achievement of set goals. The importance of organizations to act ethically and in observance of its norms, routines and rules. Adoption of fair practices in achievement of the organizational goals will for instance ensure minimal friction with the stakeholders such as the construction workers or the society. The theory could be applied by contractors who should use their experience to come up with appropriate procedures for undertaking a project in a manner that will ensure smooth implementation and guarantee success. On the other hand, there is need to understand the processes and procedures that the Government employs in management of road construction projects such as during the award of tenders, monitoring and evaluation of projects and in payment of contractors so as to ensure that the projects are delivered successfully. Whereas such processes and procedures are useful, it is important to ensure that they do not create unnecessary bureaucracy and red tape.

8. Research Methodology

The research design adopted for the study was survey research design because according to [24] survey design is described as a non-experimental design in which the researcher studies a community or a group of people to bring out findings from samples collected from the larger population through questionnaire, interviews and observation. Data for the research was sourced through questionnaires, direct observation and Oral interview. The interviews adopted for the study also allowed meanings and perceptions on the influence of critical success factors on the performance of road construction project in Nigeria.

The population of the study comprises all the 2,200 project managers, site Engineers, Design Engineers, Quantity Surveyors and Land Surveyors practicing with registered road construction films in the South-East Geopolitical Zone of Nigeria [Source: Abia, Anambra, Enugu, Ebonyi and Imo States Ministries of works, Federal Ministry of works, Niger Delta Development Commission [NDDC], Cooperate Affairs Commission [CAC] Database for Registered Contractors and Consultants, 2022]. These project managers, site Engineers, Design Engineers, Quantity Surveyors and Land Surveyors have been practicing, and are still practicing their profession of road construction within the study area. The distributions of the population among the five States in South-East zone are as follows:

The instruments that were used in the collection of data for the study are Questionnaire, Oral Interview and Road Construction Observation Checklist [RCOC] developed by the researcher. Data was analyzed using eview8 and percentage and was presented using pie chart and tables.

9. Findings and Discussion

Sex distribution of the respondents

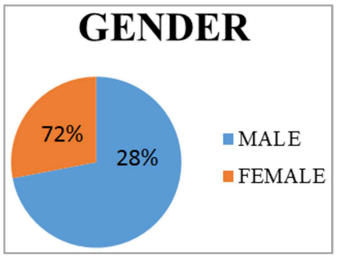

Figure 1. *Sex distribution of respondents.*

The figure 1 above revealed that out of 500 respondents, 360 [72.0%] were males while 140 [28.0%] respondents were females. Male are the majority in the study area.

Educational Qualification of Respondents

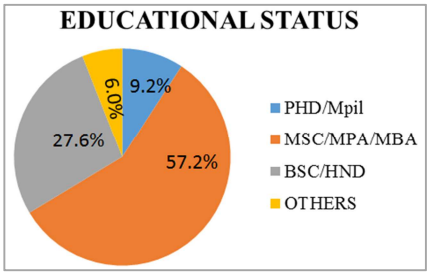

Figure 2. *Educational qualification of the respondents.*

Figure 2 above shows that 48 [9.2%] of the respondents have acquired a Ph.D./MPhil, 286 [57.2%] acquired MSC/MPA/MBA, 138 [27.6%] acquired HND/BSC while 30 [6.0%] have acquired others qualification not specified in the questionnaire.

Table 1. *Professional Distribution of Respondents.*

Profession	Frequency	Percentage [%]
Project Manager	100	20.0
Site Engineer	100	20.0
Design Engineer	100	20.0
Quantity Surveyor	100	20.0
Land Surveyor	100	20.0
Total	500	100

Source: Field Survey, 2022

The above table 1 indicated that out of 500 respondents, 100 [20%] each were project manager, site engineer, design engineer, quantity surveyor and land surveyor.

Table 2. *Respondents based on Length of time involve in road construction.*

Length of time	Frequency	Percentage
Less than 1 year	78	15.6
2-3years	166	33.2
4-5years	216	43,2
6years and above	40	8.0
Total	500	100

Source: Field Survey, 2022

From the table 2 above shows that 78 [15.6%] of the respondents involve in road construction within one year, 166 [33.2%] involve with 1-2 years, 216 [43.2%] involve within 4-5years while 40 [8.0%] involve within 6 years and above.

Analysis of the core objective

How does project planning influence the performance of road construction project?

Table 3. *Summary of distribution of responses to the core objective.*

Response	Frequency	Percentage
Strongly agreed	194	38.8
Agreed	210	42.0
Disagreed	48	9.6
Strongly disagreed	46	9,2
Total	500	100

Table 3 indicated the extent to which project planning influence the performance of road construction project. The finding of the study using simple percentages shows that 194 [38.8%] of the respondents strongly agreed that project planning influence the performance of road construction project, 210 [40.0%] of the respondents, 48 [9.6%] of the respondents disagreed, 46 [9,2%] of the respondents strongly disagreed. The high percentage of those who responded in the agreed and strongly agreed to research question one affirmed that project planning influence the performance of road construction project.

Table 4. *Regression analysis of the influence of project planning on the performance of road construction.*

Variables	X	SD
Project planning	21.2740	2.24968
Performance of road construction	53.4760	7.40155
R-value =.745		Adjusted R-squared =.554
R-squared =.555		Standard error = 4.94019

Source of variation	Sum of squares	Df	Mean square	F-value	R-value
Regression	15182.762	1	15182.762	622.104*	.000
Residual	12153.950	498	24.406		
Total	27336.712	499			

Predictor variable	Unstandardized coefficient		Std.coeff	t-value	p-value
	B	Std.error			
Constant	105.638	2.103		50.233*	.000
Project planning	-2.452	.098	.745	-24.942*	.000

Significant at.05 level. P<.05

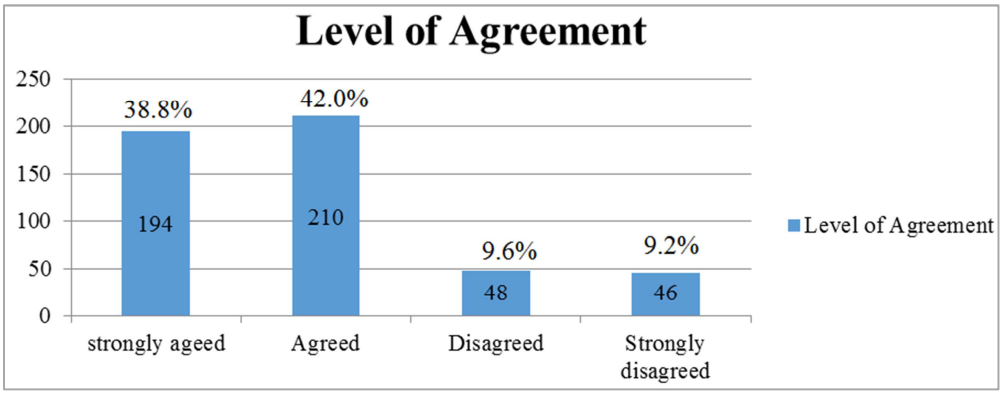

Figure 3. *Bar Chart showing the level of responses on project planning.*

The results in Table 4 show that the R-value of.745 was obtained, resulting in an R-squared value of.555 This means that the variation of project planning accounted for about 55.5 % of the total variation in performance of road construction. The p-value [.000] associated with the computed F-value [622.104] was less than.05. As a result, the null hypothesis was rejected. This means that project planning significantly influences performance of road construction, with both the regression constant [105.638] and coefficient [-2.452] contributing significantly in the prediction model [t= 50.233& -24.942 respectively, p=.000 &.000 <.05]. The prediction equation may therefore be written as:

$$y = 105.638 - 2.452x$$

where,

y = Performance of road construction

x = Project planning

10. Discussion of Findings

Project planning is a process that specifies the responsible people to the action, the process, the times and the resources involved for a particular job in the mind. The finding is in agreement with [40] who founds planning phase to involves the preparations for the project to take off smoothly. During the planning process, the functional departmental manager develops operational plans that are integrated to form the project plan which focuses on the activities that must be performed to produce the project results or deliverables. The finding is in consonance with the author [11] who stated that planning involves formulation of a number of alternative realistic work plans for achieving specified objectives and finally selecting a plan which is best suited from the stand-point of available resources and constraints imposed upon the project.

Project planning choices a company makes are not often easy decisions and some of them might turn out to be wrong but that is not an excuse for not deciding on a concrete course of action [5]. It is therefore necessary to perform proper planning since projects are capital intensive and carry along many risks and uncertainties with them [56]. The planning process in a project proceeds from the conceptualization phase of a project and continues until the project is closed. However, it is debated in the literature that in the planning phase of every project, the important considerations are technical skills, project management knowledge, and organizational approach.

11. Conclusions

From the analysis, there is significant influence of project planning on the performance of road construction project. Construction films that did proper planning of their project performed better than those that do not plan their project. The findings of the study have generated the need for early and proper project planning, timely project payments, stakeholders' involvement, high quality construction materials, effective project monitoring have significant contribution towards effective and improve the performance of road construction project. The cost of organizing the key players in the road construction in planning the project, timely release of project funds, involving stakeholders for their vital contributory ideas, using high quality construction

materials and effective project monitoring is better and safer than for the film to incur cost overrun and performing below quality standard that would have negative effects on the transporters. It is evident from the study that the roads constructed with poor quality materials and ineffective monitoring are not durable. It is also evident from the findings of the study that high quality road construction can be used effectively in improving the road construction sector and improve the economy. It is recommended that Road construction firms should undergo proper and checked planning at all levels so as to achieve timely deliveries. The planning can be done by taking all the inputs of stakeholders in the road constructions project so as to have effective road deliveries. This would help such organization to improve on their quality Performance of road construction projects.

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