

EVALUATION OF THE EFFECT OF PROJECT MANAGEMENT TECHNIQUES ON ROAD CONSTRUCTION PROJECTS IN NIGERIA

Onifade Morakinyo Kehinde, Oluwaseyi Joseph Afolabi, Ibrahim Adekunle Omogbolahan
*Department of Management Technology,
Bells University of Technology, Ota, Nigeria*

Abstract: Project Management is an innovative management practice that tends to achieve stated or specified objectives within specific time and budget limits through optimum use of resources. The aim of the study was to investigate the effect of project management techniques on the success of road construction projects in Nigeria using Julius Berger Nigeria Plc as a case study. Primary information for this research was sourced through the use of structured questionnaire gathered from 95 respondents, personal observation and interviews in the study area. Secondary data emanated from published and unpublished sources. The findings were presented in descriptive and inferential form using frequencies, percentages, tables, mean and chi-square analytical techniques. The targeted groups of respondents were contractors, site engineers, project managers and project site supervisors. The findings from this study revealed that majority of the respondents have the knowledge of project management techniques and its importance in successful road construction project execution.

Keywords: Project, Management, Construction, Road, Project Environment

1. INTRODUCTION

A project is made up of a group of interrelated work activities constrained by a specific scope, budget, and schedule to deliver capital assets needed to achieve the strategic goals of an organization.

A project could be viewed as a system, which is dynamic and ever changing from one stage to another in a life cycle; considering a generic project, its status changes from that of an idea or a concept through to feasibility studies, execution and final completion (Atkinson, 1999). Also projects are nowadays far more complicated than ever before. They involve large capital investments and embrace several disciplines, widely dispersed project participants, tighter schedules, and stringent quality standard and so on. This coupled with high speed development in Information and Communication Technology (ICT); these

factors have greatly influenced project management practices in taking advantages of newly developed management tools and the latest technology.

Project management is defined as the process of planning, scheduling and controlling all of the project activities to achieve its aims and objectives (Bhavesh, 2006). The creative concept of project management is universal and generic. This cut across all cultural, natural and logistic barriers, some corporate cultures are much more supportive of project techniques than others. Top managers who plan to introduce the project management discipline, or who wish to improve existing project performance, needs to take cognizance of cultural, and structural as well as practical and personal elements (Dykstra, 2011).

Achieving success in construction project implementation process is the major function of

project management. According to Nwachukwu (2008), the rate at which construction projects fail, or are abandoned, and the collapse of buildings is retrogressive in a developing economy like Nigeria.

Efficient project management is very important especially in the construction industry which ranks very high among other economic sectors in terms of inter-sector linkages. The importance of this sector as an agent of development is enhanced by its ability to provide gainful employment for the world's teeming population. It is evident that noticeable development and the aesthetic transformation of the environment is bound up with and predicated on the construction industry".

(Ritz, 1993) opined that aesthetic transformation and noticeable development of the environment is associated with the road construction industry".

The management of construction projects requires modern managerial knowledge as well as the understanding of the design and construction processes. Construction projects have specific sets of aims, objectives and constraints such as a required time frame for completion. In other words, it is the process of guiding a project from the very beginning along with its performance to the closure (Spinner, 1997).

(Oberlender, 1993) reveal that the management of road construction projects demands modern managerial knowledge and the understanding of the design and construction processes. The development of Nigeria and any country is measured by the length of paved roads in her cities and townships.

The performance of any road construction project depends on the strategy for success adopted by the organization responsible for its implementation and execution. The strategies for success in any road construction project are implemented in the management of the Project Time, Cost, and Quality and Material management (PMBOK, 2013).

2. STATEMENT OF THE RESEARCH PROBLEM

The performance of any construction project (be it public or private) depends on the strategy for success adopted by the organization responsible for its implementation and execution. The strategies for success in any construction project are implemented in the management of the Project Time, Cost, Quality and Material management using project life cycle concept.

In most cases, both public and private construction projects are hardly completed on time, within cost, quality and material specifications. New construction projects and newly rehabilitated or maintained infrastructure become decrepit and wrecked within a few months of commissioning despite the capital commitments on them. Collapse of building facilities during construction in Nigeria can best be described as a holistic financial lost like a prudent investor dramatically digging a hole and burying his life savings and denying alternative investment opportunities. Construction projects failure, abandonment and collapse do not encourage development and investment and that calls for project management solution.

Project management is believed to be justified as a means of avoiding the ills inherent in the construction and production sectors of the economy and for which reasons most projects fail and or abandoned. The project managers' role arises from the need for a technical expert to take charge and control events on the project implementation process i.e someone who understands the intricacies of coordinating, controlling, organizing and directing the efforts and activities of the professional team (Wideman, 1996).

The success of any project implementation process in the construction industry in the public and private sectors depend largely on the project manager's concept of staff appointments and control, strict monitoring of time, cost, material, quality and environmental constraints.

3. LITERATURE REVIEW

Many researchers have studied the concept of construction management. Ritz (1994) stated, “basic construction project management philosophy is simply in three words: plan, organize, and control”. In another definition, Dykster (2011) said that construction management is “all the processes involved in organizing, monitoring, and controlling a construction project”. The construction industry is one of the important fields that use project management knowledge. Carrillo, Robinson, Al-Ghassani, and Anumba (2004), who studied knowledge management in the UK construction industry, said that “the construction industry delivers large, expensive, custom-built facilities at the end of a construction process”. The authors reviewed the construction process and the impact of knowledge management practices on the construction industry by conducting a survey among UK consulting and contracting firms. They found the following:

- i. 75% of organizations expect to have knowledge management strategy.
- ii. The lack of standard work processes and the lack of time are the most important barrier to knowledge management.
- iii. 45% of the organizations have appointed a person or group with responsibility for knowledge management.

What drives construction project success has been a hot topic in the last few years and has attracted many researchers, (Nguyen, Ogunlana and Lan, 2004; Yates and Eskander, 2002) used a survey to analyze the causes of delays that affect the planning and scope development phase in construction projects. In their survey, which included 27 types of delay, the participants were asked to rank these types-of-delay factors. The results showed that the three highest-ranked factors were “(a) constant changes in project requirement, (b) developing multiple projects at the same time, and (c) lack of communication among various divisions”. Moreover, these three factors received the most modification suggestions.

Ashley, Lurie and Jaselskis (1997) studied and determined construction project success, obtaining more than 200 factors from both a study of the literature and information from construction project personnel. These factors were reduced to 46 factors and separated into five groups as follows:

- (i) Management, organization, and communication
- (ii) Scope and planning
- (iii) Controls
- (iv) Environmental, economic, political, and social
- (v) Technical.

Ashley et al. (1997) conducted a survey to find, from the contractors’ and owners’ perspectives, the top factors in construction success. They found 15 factors rated as the top. They then chose 11 from the top 15 to analyze further. The authors also conducted interviews to collect data. A total of 16 project samples were gathered from eight companies, each company contributing two projects (an average project and an outstanding project). The authors focused on individuals who had experience in different types of projects. The interview questions included 90 subjective and objective questions relating to the 11 factors. Various measures of success were used as success criteria. Based on the separation between average and outstanding projects, the authors found seven factors to be the most significant in determining project success: “planning effort, scope and work definition, project manager goal commitment, project team motivation, goal orientation, project manager capabilities and experience, safety, and control systems” The authors found six significantly important criteria to use to measure construction project success: “budget, schedule, functionality, contractor satisfaction, client satisfaction, and project manager/team satisfaction”.

Moreover, Ashley et al., 1997 continued to analyze this research to find the correlations between factors and success criteria by using regression analysis. They found strong relationships between the following: -

construction planning effort and functionality - project management technical capabilities and end user satisfaction - technical uncertainty and end user satisfaction - project management administrative capabilities and budget - legal political environment and follow-on work.

Albert and Ada (2004) provided an overview of success measures for construction projects. After reviewing the literature from the last

decade, they developed a set of key performance indicators (KPIs) for measuring construction success (Figure 1). After that, the authors applied the KPIs to three cases studies. They found that “in the construction industry, time, cost, and quality have long been defined as the basic criteria of measuring success”. Moreover, other measures become important in the industry, such as, safety, functionality, and satisfaction.



Figure 1: KPIs for construction projects
Adapted from: (Albert and Ada, 2004)

In an attempt to determine the factors in construction project success, Phua and Rowlinson (2004) studied the importance of cooperation. They used data from 29 interviews and 398 quantitative responses from construction firms in Hong Kong. They found a link between cooperation and project success and discovered that personal friendship between project participants is a factor that can affect the success of a construction project.

Li in 1993 analyzed the cost of construction projects through a study of the theoretical methods and practice of construction cost

management in China. He developed a list of factors that have an effect on construction cost, and stated, “bidding of a project, contract signing and management, examination of a construction management plan, and management of materials all have decisive effects upon formation of construction cost”. Oberlender (1993) pointed out that defending the goals of a project in the early phase of a construction project is important. In addition, having a high engineering design will help to reduce the cost and time and assure good quality. Nguyen et al. (2004) identified and studied relationships between success factors in

the Vietnamese construction industry. Based on previous research, the authors included 20 success factors, but did not include time, cost, and quality as general factors. They went into more detail, such as commitment to project; frequent progress meetings, absence of bureaucracy, multidisciplinary project team, and so forth. Then, after conducting a survey of contractors, owners, and consultants, Nguyen et al. found that the top critical success factors for construction projects in Vietnam were:

- (i) competent project manager
- (ii) adequate funding throughout the project
- (iii) multidisciplinary project team - commitment to project

- (iv) availability of resources

Other researchers started to think about new success criteria, not just quality, time, and cost. Yates, J. K., & Eskander, A. (2002) stated, “The building project is most successful when it is capable in integrating the three success dimensions”. These three-dimensions are project management success, product success, and market success, as shown in Figure 2. Moreover, Atkinson (1999) suggested that it is time to think about success criteria other than “The Iron Triangle,” such as stakeholder benefits.



Figure 2: Success criteria for construction building projects (Yates, J. K. and Eskander, A., 2002).

Jha and Iyer (2007) studied the impacts of different factors/attributes on project performance. They suggested that there could be two categories of criteria: (a) objective criteria, “which are tangible and measurable, are schedule; cost; quality; safety, and dispute”; and (b) subjective criteria, which “include client satisfaction; contractor satisfaction; and project management team satisfaction”. The result shows that three factors (commitment,

coordination, and competence) are important for achievement of cost, time (schedule), and quality objectives. Finally, after reviewing project and construction project management that covered some history and the success criteria and factors, the researcher found many different criteria could be considered as the most common criteria for a successful construction project.

3. RESEARCH METHODOLOGY

This section deals with the methodology adopted in conducting the research. It includes research design, study population and modality for sample selection and data collection instrument. It gives an insight into the method used in analyzing the data collected.

The major focus of the research methodology is to facilitate the researchers on the effect of project management on road construction project in Nigeria.

3.1 Research Design

The study adopted a descriptive survey design. Descriptive research is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation. Descriptive research is a study designed to depict the participants in an accurate way. More simply put, descriptive research is all about describing people who take part in the study. There are three ways a researcher can go about doing a descriptive research project, and they are: Observational; Case study and Survey.

3.2 Sample Size

Population is the set of all the entities concerning which statistical inference are to be drawn. It is a complete enumeration of all the units in a sampling frame from which the research is to be conducted. The population of this research consists of the project management professional in Lagos state and the sample was the ninety-five (95) staff of Julius Berger Nigeria Plc including project contractors, site engineers, project managers, project site supervisors and other professionals involve in the road construction project work. Questionnaires are research instruments consisting of a series of questions and other prompts for the purpose of gathering information from respondents. These were used

to obtain the respondents' scores which were analysed.

3.3 Theoretical Formulation

The data entry started immediately after data collection. The collected data was checked, verified and then entered into the computer. Only fully completed questionnaires were entered into the computer for final analysis.

The analysis of data involves more of statistical tools in the presentation of information. Simple percentages were used in qualifying the relationship in one datum to another.

The percentage frequency method is used to determine the expected frequency using the expression in equation (1)

$$\frac{(FX100)}{Tr} \quad (1)$$

F= Frequency, TR= Total Number of Respondents. The research hypothesis will be tested using Chi Square non parametric method used is based on the expression in equation (2).

$$\frac{\sum(Fo-Fe)^2}{Fe} \quad (2)$$

Where \sum = summation;

Fo= observed;

Fe= expected

The degree of freedom can be calculated using the formula DF= (r-1) (c-1) Where r = number of rows; c = number of column.

The expression in equation (1) was employed and the sample size was determined and shown in Table 1 below for the population which was 20,000,534 based on census figures for the population of Lagos State.

The data obtained represented appropriately a sample size with 10% error. Out of the one hundred (100) questionnaires distributed, ninety-five (95) respondents' scores were analysed

Table 1: Sample Size and their Percentage Errors

% error	5%	10%	20%
Sample Size	399.96	99.9	24.9
% error	30%	40%	50%
Sample Size	11.11	6.24	5.99

4. RESULT AND DISCUSSION

Table 2: Respondents Scores for Material Management Approach mainly in use on Construction Sites

STATEMENTS	STRONGLY AGREED	AGREED	UNDECIDED	DISAGREED	STRONGLY DISAGREED	Column Sum
Eye ball inventory	5	46	15	28	1	95
Record the use and inventory of materials during construction	39	48	2	5	1	95
Prepare & monitor material Schedule	36	58	0	1	0	95
Perform Material Variance Analysis	19	65	2	8	1	95
Row Summation	99	217	19	42	3	380

Table 2. shows the respondents' scores for material management approach mainly in use on construction sites. "Perform Material Variance Analysis" has the highest respondent score of 65 agreeing on its impact on the success of projects.

Table 3: Chi Square Parameters for Material Management Approach mainly in use on Construction Sites

Fo	Fe	Fo-Fe	(Fo-Fe) ²	$\frac{(Fo - Fe)^2}{Fe}$
5	24.75	-19.75	390.06	15.76
39	24.75	14.25	203.06	8.2
36	24.75	11.25	126.56	5.11
19	24.75	-5.75	33.06	1.34
46	54.25	-8.25	68.06	1.25
48	54.25	-6.25	39.06	0.72
58	54.25	3.75	14.06	0.26
65	54.25	10.75	115.56	2.13
15	4.75	10.25	105.06	22.12
2	4.75	-2.75	7.56	1.59
2	4.75	-2.75	7.56	1.59
28	10.5	17.5	306.25	29.17

Fo	Fe	Fo-Fe	(Fo-Fe) ²	$\frac{(Fo - Fe)^2}{Fe}$
5	10.5	-5.5	30.25	2.88
1	10.5	-9.5	90.25	8.6
8	10.5	-2.5	6.25	0.6
1	0.75	0.25	0.06	0.08
1	0.75	0.25	0.06	0.08
1	0.75	0.25	0.06	0.08
				101.56

$$\frac{\sum(Fo-Fe)^2}{Fe} = 101.56$$

DF = (5-1) (4-1) = (4) (3)

Degree Of Freedom = 12

Table 4: Respondents Scores for the Perceived Causes of Time Overrun

STATEMENTS	STRONGLY AGREED	AGREED	UNDECIDED	DISAGREED	STRONGLY DISAGREED	Column Sum
Owner-finance	13	62	1	14	5	95
Material Management related	38	25	2	17	13	95
Labour related	19	51	3	22	0	95
Contractor related	23	57	3	11	1	95
Variation order based	37	45	1	10	2	95
Force majeure related	19	53	3	15	5	95
Row Summation	149	293	13	89	26	570

Table 4. shows the respondents’ scores for material management approach mainly in use on construction sites. “Owner-finance” has the highest respondent score of 62 agreeing on its impact on the success of projects.

Table 5: Chi Square Parameters for the Perceived Causes of Time Overrun

Fo	Fe	Fo-Fe	(Fo-Fe) ²	$\frac{(Fo - Fe)^2}{Fe}$
13	24.83	-11.83	140.03	5.64
38	24.83	13.17	173.36	6.98
19	24.83	-5.83	34.03	1.37
23	24.83	-1.83	3.36	0.14
37	24.83	12.17	148.03	5.96
19	24.83	-5.83	34.03	1.37
62	48.83	13.17	173.36	3.55
25	48.83	-23.83	568.03	11.63
51	48.83	2.17	4.69	0.1
57	48.83	8.17	66.69	1.37
45	48.83	-3.83	14.69	0.3
53	48.83	4.17	17.36	0.36
1	2.17	-1.17	1.36	0.63
2	2.17	-0.17	0.03	0.01
3	2.17	0.83	0.69	0.32
3	2.17	0.83	0.69	0.32
1	2.17	-1.17	1.36	0.63
3	2.17	0.83	0.69	0.32
14	14.83	-0.83	0.69	0.05
17	14.83	2.17	4.69	0.32
22	14.83	7.17	51.36	3.46
11	14.83	-3.83	14.69	0.99
10	14.83	-4.83	23.36	1.57
15	14.83	0.17	0.03	0
5	4.33	0.67	0.44	0.1
13	4.33	8.67	75.11	17.33
1	4.33	-3.33	11.11	2.56
2	4.33	-2.33	5.44	1.26
5	4.33	0.67	0.44	0.1
				68.74

$$\frac{\sum(Fo-Fe)^2}{Fe} = 68.74$$

DF = (5-1) (6-1) = (4) (5)

Degree Of Freedom = 20

4.1 Discussion

Based on the Hypothesis testing, the Null Hypothesis (There is no significant relationship between the utilization of project management techniques in construction project) is rejected while the Alternate Hypothesis (There is significant relationship between the utilization of project management techniques in construction project) is accepted.

5. CONCLUSION

Project management is the art and science of planning, designing and managing work throughout all the phases of the project life cycle". It is also regarded as a system or process of planning, designing, scheduling, managing and controlling interconnected project activities in order to achieve specific objectives or goal within a specific time, budget and standards.

Based on the findings of the study, it is clear that the Julius Berger Nigeria Plc Staffs have high level of knowledge on project management which has benefited the company in increasing construction project success rate.

The most important step towards project management maturity is to set up project management operations that can best be developed and utilized. Skilled personnel and direct efforts are used via a set of project management practices. In the construction industries, some components and practices include work scope, time, resources, costs, quality, communication, and risk and contracts procurement. Out of all these practices this study found out that if these management practices are well managed, there is a very high possibility of having a viable project that will guarantee a sound business success.

REFERENCES

Ashley, Lurie and Jaselskis (1987). Determinants of construction project success. *Project Management Journal*.

Atkinson, R. (1999). *Project management: cost, time and quality, two best guesses and a phenomenon, it's time to accept other*

success criteria. *International Journal of Project Management*.

Bhavesh, M.P. (2006). *Project Management (strategy Financial Planning, Evaluation and Control, New Delhi PTV Ltd*

Carrillo, P., Robinson, H., Al-Ghassani, A., & Anumba, C. (2004). Knowledge management in UK construction: strategies, Resources and Barriers. *Project Management Journal*.

Dykstra, A. (2011). *Construction project management: A complete introduction. Santa Rosa, CA: Kirshner Publishing Company Inc.*

Jha, K. N., and Iyer, K. C., (2007). Commitment, coordination, competence and the iron triangle, *International Journal of Project Management* 25(5), 527–540.

Nguyen, D. N., Ogunlana, S. O., & Lan, D. T., (2004). A study on project success factors in large construction projects in Vietnam. *Engineering, Construction and Architectural Management*, 11(6), 404-413.

Nwachukwu, C.C. (2008). *The Analysis of factors that constraint project Management success of public and private sector construction in Nigeria Unpublished PhD Thesis, Owerri: Federal University of Technology*

Oberlender, G. D. (1993). *Project management for engineering and construction. New York, NY: McGraw-Hill.*

Phua, F. T., Rowlinson, S. (2004). How important is cooperation to construction project success? A grounded empirical quantification. *Engineering, Construction and Architectural Management*, 11(1), 45-54.

PMBOK (2013), *A guide to the project management body of knowledge: PMBOK® guide (5th Ed.)*. Project Management Institute Newton Square.

Ritz, G. J. (1993). *Total construction project management. New York, NY: McGraw-Hill.*

Spinner, M (1997): *Project Management: Principles and Practice of management (Longman publishers)*.

Wideman, R.M. (1996), *Improving Project Management: Linking Success Criteria to Project Type*

Yates, J. K., and Eskander, A. (2002). *Construction total project management planning issues. Project Management Journal*