

# ASSESSMENT OF THE RELATIVE IMPORTANCE AND RELATIONSHIPS OF PROJECT MANAGEMENT PRACTICES FOR THE CONSTRUCTION INDUSTRY IN NIGERIA

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Keywords:

*Construction projects; Project management; Relative importance value; Project management practices; Structural Equation Model*

## ABSTRACT

*This study assessed the relative importance and relationships of the project management practices of construction companies in Nigeria. A total of 221 valid responses were received from the respondents from 250 questionnaire survey carried out on their professional certifications and the level of usage of fifty-three identified project management practices. The result of the data analyses in SPSS (statistical package for social sciences) and LISREL (linear structural relationship) indicates that only 22% of the respondents have at least a certification in project management which implies a poor level of skillfulness in the utilization of project management tools, methods and techniques in managing projects. Also, the respondents agreed that the utilization of project management practices enhance project management as indicated by the above average value of their relative importance. However, it was found out that there was poor utilization of the tools relating to budget management as indicated by the below average value of the relative importance index. The SEM model indicates that communication management positively influences the other project management practices with the highest level of impact on procurement management. It also indicates that cost management negatively influences quality management which implies that excessive control of project cost could result to a compromise in the quality of the output. These findings calls for project organizations to encourage and support the training of their professionals in project management practices and certifications.*



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## 1. INTRODUCTION

The construction industry is one of the key contributors to the gross domestic product (GDP) of a nation which is a measure of the output, employment and income of the economy. Every year, the government and private sector

invest resources into different categories of projects targeted at achieving some defined objectives. In order words, projects are initiated and completed to ensure the economy of a nation grows steadily in a sustainable manner (Ajayi & Oyedele, 2018). This has made project management and project performance of global interest

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because of the realization of the growing demand, and need to improve project performance in particular and the construction industry as a whole (Ofori,2011). Every construction project is exposed to multivariate which come in different dimensions and have the capacity to affect project outcome. The effectiveness and efficiency of a construction company is majorly determined by their expertise in managing construction related variables.

In the past decade, the Nigerian construction industry had been bedeviled with poor project performance or outright failures especially in the building and road construction sector. Adebowale et al. (2016) documented 34 cases of failed building construction projects that cut across the states of Nigeria with the worst cases being in Lagos and Abuja with records of 16 and 7 respectively from 1995 to 2015 with causes including structural failures, poor design, poor supervision, carelessness and use of unskilled personnel. The number of casualties altogether were 315 lives and loss of resources worth billions of Naira. The most recent report on cases of failed building construction projects revealed that not less than 436 lives were lost in 55 failed building structures in Nigeria from 2012 to 2016 as provided by the Council for the Regulation of Engineering in Nigeria (COREN) (Okechukwu, 2017). These records imply that there is certainly a problem with the adopted project management practices by construction companies. It is a fact that to manage projects effectively and meet the functionality requirement and expectation of customers, certain project management practices have to be embraced and adopted. There are ten knowledge areas which if well adopted and applied by the project organization will result in project success (PMI, 2017). It is therefore necessary for project organizations to ensure that their professionals in project management are well equipped in the utilization of these tools, technics and methods as prescribed in the Project Management Body of Knowledge (PMBOK) Guide. In addition, the structure of the dynamism of the interaction between these variables is highly essential for the project organization for effective monitoring and control (Unegbu et al., 2020).

Limited research studies exist in literature that have studied the level of application, relative importance and relationships of the project management practices of construction companies especially in developing countries. Therefore, this research assess the project management practices in some selected construction companies in Nigeria and determines their relative importance index and relevant relationships that exist among them. This study shall reveal the top important project management practices for the project knowledge areas (management of scope, time, cost, quality, risk, human resources, communication, procurement and stakeholders) used for the study. It will also reveal the pattern of relationships between the project management practices which will enable project organizations to take more informed decisions concerning the training and

professional development of their project management professionals.

## 2. PROJECT MANAGEMENT PRACTICES

### 2.1 The Concept of Project

Several definitions of a project abound in research among which one of the earliest acceptable one identifies it as the organization of people in order to achieve a specific deliverable with imposed constraints (time, cost, risk, and quality) and expected functionality requirement (Turner, 1983). Although this definition was accepted, it failed to recognize a project as an endeavor rather than an organization. It also failed to address the transient form of a project as well as the form of the output which could be tangible or intangible.

Other research efforts have defined a project as an endeavor that consists of interdependent activities carried out to produce a unique output within a predetermined delivery time subject to certain constraints (Pinto & Prescott, 1988). As is the case with the definition of other concepts, some of the elements included in this definition could be questioned but as pointed out in Jonathan (1995), it is generally accepted that a project is a given undertaking which could be planned to produce a unique output that is subject to constraints such as time, schedule, quality and resources. Planning of the project generally creates an understanding of the project fundamentals such as what needs to be done, how and when it needs to be done, the resources required and the nature of the outcome.

Pinto and Slevin (1988) in their definition of project identified transience, budget constraint, series of interrelated activities, and specific or predetermined goals and objectives as the characteristics of a project. Again, this definition looks incomplete in not addressing the uniqueness of a project and the novelty of the approach used to complete the project activities. While examining the political dimension of the definition of a project, Declerck et al. (1997), defined a project as a set of activities which are limited by space and time, targeted at achieving a definite goal and influenced by the political, economic and social environment. In other words, a project interacts with the political, social and economic environment. This is quite right because politicians use projects as campaign tools in terms of promising the provision of infrastructures and social amenities to the masses which will satisfy their social needs. Generally it has been proven that projects have direct relationship with the economy of nations especially in the area of construction projects which was reviewed earlier.

Turner (1990) made a definitive statement about the concept of project that formed the foundation for his definition of the project as an effort which involves the novel organization of resources to complete a unique

scope of work, within the constraint of budget and schedule in order to attain desired results as defined in the project objectives. This definition contains three features of a project which are:

- It is unique implying that no two projects can be the same even though they may be similar.
- Its activities are completed using a novel process. This implies that different approaches are used to undertake different projects, though, the approaches may be similar they can never be exactly the same.
- It is temporary because of the time constraint. In essence, it has a definite beginning and ending.

It could as well be deduced from this definition that resources, scope of work, time and cost are key factors to be critically evaluated before embarking on any project. Analyzing this definition further, Turner and Muller (2002), inferred that the aim of a project is to deliver change within a process that is flexible, goal oriented and staged, under the pressures of uncertainty, integration and transience with the features of uniqueness, novelty and transient.

In their study of the nature of the project as a 'temporary organization', Turner and Muller (2002) discussed the project as having different function such as transient, production, change agency, use of resources and managing uncertainty. The result of these discussions was the defining of a project as a temporary organization that involve resource allocation to undertake and endeavor that is unique, novel and transient in order to achieve defined objectives amidst uncertainties. (Turner & Muller, 2002)

## 2.2 Project Management

Project management as a field and body has attracted the attention of research studies over the years. One of the first definitions was given by Oisen (1971), which defined it as the application of a variety of tools and techniques to direct the resources required to produce a unique output within the constraint of quality, budget and schedule. The constraint of schedule, budget and quality referred to in this definition is popularly called 'iron triangle' which over the years was traditionally used as the criteria for measuring project success (Chau et al., 1999).

The Project Management Institute (PMI) defined project management as the application of knowledge, skills, tools and techniques to project activities in order to meet the expectation of project stakeholders (PMI, 2017). From their perspective, the management of a project requires the use of structured processes that consists of five phases from the beginning to the close of the project in order to achieve specified deliverables. The most popular standard for project management is the Project Management Body of Knowledge (PMBOK) Guide, developed by the Project Management Institute (PMI).

The PMBOK is seen as an indispensable tool in managing projects.

Looking at the management perspective of the concept of project management, The British Standard for Project Management BS6079 (1996) and Kerzner (2003) defined it as the application of the elements of management to resources and activities to meet the predefined objectives within the constraint of stated criteria. This implies that project management demands planning, organizing, monitoring, control and motivation of project personnel towards achieving project objectives. Every project has material, human and financial resources which need to be organized efficiently and effectively around the project activities in order to achieve the project objectives within the specified constraints. Following the same perspective, Reiss (1973), viewed project management as a human activity that is targeted at achieving specified objectives within a timeframe. Thus project management is made up of planning, change management and resource management (Akinson, 1999). Project management is the major driver of the change process experienced by many organizations which progress from a more stable, machine like model to a more dynamic one in the face of the very dynamic environmental influences (Seymour et al., 1992). Organization change process is an imperative for any firm to cope with the dynamism of the business environment; hence, project management is an essential for organizations that want to remain relevant in the industry.

While attempting to explain the concept of project management and its importance in managing large and complex industrial projects that involve many different tasks that must be completed to meet the objectives, Lock (2003) pointed out the need for the structure of organization to run smoothly based on interaction and cooperation to meet the required outcome. As such, it is imperative for such organizations to possess high management tools and methodologies that will aid in controlling project constraints (time, cost and quality) and satisfy increased demand for efficiency in the use of project resources. From the foregoing, it could be said that project management is a specialized field of management which has evolved to control and coordinate complex project activities in industries. Projects exist in an environment that is dynamic demanding for improved and evolving methods of solving problems. Therefore, there is continuous need to evolve novel approaches and techniques in project management.

## 2.3 Project Management Knowledge Areas and Processes

According to PMI (2017) PMBOK Guide, the project management knowledge areas contains a complete set of the areas of specializations including jargons, tools, concepts and tasks that need to be mastered in order to successfully manage projects. These are project integration management, project scope management,

project time management, project cost management, project quality management, project human resource management, project communications management, project risk management, project procurement management and project stakeholder management. As pointed out by Zwikael (2009), effective project management is facilitated by carefully applying them in managing projects. Thus, the ability of a company to train their project management professionals on the use of emerging project management practices in the management of their projects is a measure of their effectiveness and competitiveness in their industry (Chou & Yang, 2012). This will in turn enhance the performance of their projects and their overall efficiency and effectiveness in managing projects.

A process could be said to be set of interconnected activities that need to be undertaken in order to create a predetermined product, service or result PMI (2017). They are the channels that ensure smooth flow of project throughout its lifecycle. Altogether there are 47 project management processes in the PMBOK Guide which interact with the knowledge areas. Though the content of the PMBOK Guide looks fantastic, research studies have shown that it has no answers to project difficulty resulting from the control of certain variables which are beyond its capacity (Morris & Hough, 1987). Subsequent study on World Bank's development projects, The World Bank (1997) and studies by Miller and Lessard (2000) on complex and large engineering projects affirm this view. Many of the above mentioned factors influencing projects are more prevalent in developing countries and hence the reason for the poor performance of projects in these countries.

## **2.4 Review of Related works**

Alwaly and Alawi (2020) assessed the factors that affect the utilization of the PMBOK Guide by companies in the construction industry in Yemen. The result of their data analysis indicated that there is lack of adequate training of the project management professionals on the utilization of the PMBOK Guide in project management. This was evidenced by the sparse utilization of the variables by the surveyed companies in managing projects accounting for mostly variables related to quality and process management. Hence, they highly recommended project organizations to encourage and support their personnel to acquire adequate training in project management. Investigating the impact of the implementation of project management on project success, Al-Hajj and Zraunig (2018) collected a data from over ten nation for analysis. The research finding indicated that though the majority of the projects implemented project management, many of them did not adopt contemporary project management tools, methods and techniques. The result also revealed that the impact of project management practices on project success depends on the practitioner's training and some other human related factors.

The research study carried out by Abbasi and Al-Mharmah (2000) used 50 firms to examine the project management practices adopted by construction companies in the developing country, Jordan. This study focused on identifying the most important project management techniques practiced in the firms using quantitative research. The identified project management practices include activity on arrow (AOA), bar chart, activity on node (AON), organizational breakdown structure (OBS), program evaluation and review technique (PERT), critical path method (CPM), levelling of resources, analyzing time cost, progress report, work breakdown structure (WBS), corrective planning development and implementation, evaluation of project success and project management software. These project management methods applied by the surveyed firms seemed to be limited and crude in nature. Focusing on the methods, tools and techniques, and methodologies adopted by construction companies in project management, White and Fortune (2002) used 44 variables classified under 6 constructs for data collection. The data analysis result indicated a shift from the utilization of crude to advanced project management methods, tools, and techniques in managing projects. This indicated an improvement in the project management practices which was expected since the study was carried out in a developed country. Thus, the level of development of a nation positively influences the project management practices adopted by her construction industry.

The reviewed literatures indicate that the level of application of project management varies from one country to another depending on the level of development which determined the level of training of project management professionals. Thus, developed countries tend to be more advanced in the application of project management practices in the management of their projects. However, none of the reviewed literatures studied the level of importance and relationships of the project management practices to construction companies. Therefore this study focuses on assessing the level of importance and relationships of the project management practices for each knowledge area to the project management professionals.

## **3. METHODOLOGY**

The critical component of this research is the identification of the project management multivariate which will be used for data collection. In order to determine and assess the project management practices used by construction companies in Nigeria, the indigenous registered companies with construction projects in the North Central Geopolitical Zone were the focus where the representative sample of the population was drawn for data collection.

Quantitative data analysis approach was utilized for this research with questionnaire used for collecting data from

respondents. The project management practices identified in the literature review that were widely adopted in the implementation of construction projects were selected to structure the questionnaire. It was designed to sample the option of the respondents on their level of utilization of the project management practices in the management of their construction projects. The data collected was analyzed to find the relative importance of the project management practices to the construction companies for each project management knowledge area and the relationships between them using the relative importance index and SEM respectively. Ten construction companies were selected randomly from the construction companies with active projects in the North Central Geopolitical Zone of Nigeria with an estimated population of 650 professionals in construction project management were used for the study. The sample size used for the survey was calculated to be 250 by applying the parameters stipulated by Yemene (Singh & Masuku, 2014). A total of 250 respondents with a minimum of 5 years of work experience in the construction industry in Nigeria were selected from 10 randomly selected construction companies. They were selected based on the number of construction projects executed by the companies in the last 10 years. In order to facilitate effective distribution and response of the respondents to the questionnaire, a representative was selected from each sampled company who was

thoroughly put through on how to respond to each of the questions and other challenges that may be encountered in the process.

### 3.1 The Project Management Practices and Questionnaire Design

A total of 53 project management practices (variables) were selected from the reviewed literatures and the PMBOK Guide from the 9 project management knowledge areas selected for the study as shown on Table 1. The questionnaire was divided into two parts, the first part collected information of the background of the construction industries (number of projects handled in the past 10 years, how long they have been in the construction industry in Nigeria and the number of project management personnel with certification in project management) and general information on the respondents such as their qualification and number of professional certification in project management, while the second part contained the 53 variables grouped into 9 constructs based on the project management knowledge areas. The respondents were demanded to rate the level of importance of each of the variables on a five point Likert scale where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

**Table 1.** Project Management Practices

S/N	Construct	Variables	Label
1	Scope Management (SM)	Planning scope management	X <sub>11</sub>
		Collection of scope requirement	X <sub>12</sub>
		Definition of scope (clarity)	X <sub>13</sub>
		Scope variation	X <sub>14</sub>
		Identification of alternatives	X <sub>15</sub>
		Work breakdown structure (WBS)	X <sub>16</sub>
		Analyzing variance	X <sub>17</sub>
2	Time Management (TM)	Planning schedule management	X <sub>21</sub>
		Defining activities	X <sub>22</sub>
		Sequencing activities	X <sub>23</sub>
		Estimating the resources	X <sub>24</sub>
		Activity estimation (duration)	X <sub>25</sub>
		Developing schedule	X <sub>26</sub>
		Schedule control	X <sub>27</sub>
3	Cost Management (CM)	Cost plan management	X <sub>31</sub>
		Cost estimation	X <sub>32</sub>
		Determination of budget	X <sub>33</sub>
		Controlling of costs	X <sub>34</sub>
4	Quality Management (QM)	Analyzing cost-benefit	X <sub>41</sub>
		Estimating the cost of quality	X <sub>42</sub>
		Analyzing cause and effect	X <sub>43</sub>
		Use of Control charts	X <sub>44</sub>
		Quality assurance performance	X <sub>45</sub>
		Statistical sampling	X <sub>46</sub>
5	Risk Management (RM)	Creating risk management plan	X <sub>51</sub>
		Risk Identification	X <sub>52</sub>
		Analyzing risk qualitatively	X <sub>53</sub>
		Analyzing risk quantitatively	X <sub>54</sub>
		Risk response planning	X <sub>55</sub>
		Controlling risks	X <sub>56</sub>

**Table 1.** Project Management Practices (Continued)

6	Human Resource Management (HRM)	Utilization of organogram	X <sub>61</sub>
		Interacting system	X <sub>62</sub>
		Pre-assignment	X <sub>63</sub>
		Negotiation	X <sub>64</sub>
		Developing project	X <sub>65</sub>
		Appraisal of project performance	X <sub>66</sub>
		Interpersonal skills of managers	X <sub>67</sub>
7	Communication Management (COM)	Communication technology	X <sub>71</sub>
		Communication requirements	X <sub>72</sub>
		Communication methods and models	X <sub>73</sub>
		Management of information system	X <sub>74</sub>
		Reports on performance	X <sub>75</sub>
8	Procurement Management (PROC)	Analysis of make or buy	X <sub>81</sub>
		Conduct of market research	X <sub>82</sub>
		Techniques for evaluating proposal	X <sub>83</sub>
		Reviewing procurement performance	X <sub>84</sub>
		Conduct of audit and inspection	X <sub>85</sub>
		Records and payment system management	X <sub>86</sub>
9	Stakeholder Management (SKM)	Analysis of stakeholders	X <sub>91</sub>
		Planning Stakeholder management	X <sub>92</sub>
		Communication methods	X <sub>93</sub>
		Interpersonal and management skills	X <sub>94</sub>
		Information management systems	X <sub>95</sub>

### 3.2 Data Analysis Approach

The analyses of the data was conducted in five phases. First descriptive statistics in statistical package for social sciences (SPSS) was used to analyze the background information of the respondents. Second, the relative importance index (RI) of the project management practices was calculated in Microsoft Excel using the formula in equation (1) (Aibinu & Odeyinka, 2006).

$$RI = [5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1] \quad (1)$$

A\*N

Where n<sub>5</sub> is the number of respondents that strongly agree, n<sub>4</sub> is the number of respondents that agree, n<sub>3</sub> is the number of respondents that are neutral, n<sub>2</sub> is the

number of respondents that disagree and n<sub>1</sub> is the number of respondents that strongly disagree; A and N are the highest weight (5) and number of valid response (221) respectively. Third, in order to reduce the number of the variables used for structural equation model (SEM), exploratory factor analysis (EFA) was carried out in SPSS. Fourth, the reliability and validity of the constructs were calculated using Cronbach's alpha test, average variance extracted (AVE) and composite reliability (CR) tests respectively (Hair et al., 2010). Last, the relationship between the project management practices was analyzed using SEM in LISREL. The result of this analyses was validated using four goodness of fit (GOF) indices which were Chi-square/degree of freedom (X<sup>2</sup>/df), comparative fit index (CFI), Tucker Lewis index or non-normed fit index (TLI or NFI) and root mean square error of approximation (RMSEA) as shown in Table 2 (Karl et al., 2016; Kline 2005).

**Table 2.** The Goodness of Fit Statistics used (Karl et al., 2016; Kline 2005)

SN	GOF	Recommended
1	Chi square –degree of freedom ratio (X <sup>2</sup> /df)	Levels from 1-3
2	Non-normed fit (NNFI)	0<NNFI>1 (from no fit to excellent fit)
3	Comparative fit (CFI)	0<CFI>1 (from no fit to excellent fit)
4	Root mean square error of approximation (RMSEA)	0.1>RMSEA<0.05 (from fairly acceptable fit to very good fit)

### 3.3 Hypothetical SEM Model

In order to analyze the relationship between the project management practices, a hypothetical SEM model was developed using nine project management knowledge areas and fifty three project management practices based on the reviewed literatures and the advice of ten experts in the field of construction project management who were consulted for input. The following hypotheses were drawn for testing in LISREL.

- 1) Communication management positively influences scope management.
- 2) Communication management positively influences cost management.
- 3) Communication management positively influences time management.
- 4) Communication management positively influences quality management.
- 5) Communication management positively influences risk management.

- 6) Communication management positively influences procurement management.
- 7) Communication management positively influences stakeholder management.
- 8) Cost management positively influences procurement management.
- 9) Procurement management positively influences quality management.
- 10) Scope management positively influences procurement management
- 11) Risk management positively influences quality management.
- 12) Scope management positively influences risk management.
- 13) Scope management positively influences

- quality management.
- 14) Cost management positively influences quality management.
- 15) Time management positively influences quality management.
- 16) Scope management positively influences time management.
- 17) Scope management positively influences cost management

Figure 1 clearly represents these relationships as indicated by the labels on the path diagrams. These relationships were translated into SIMPLIS Syntax for the testing of the SEM in LISREL as represented.

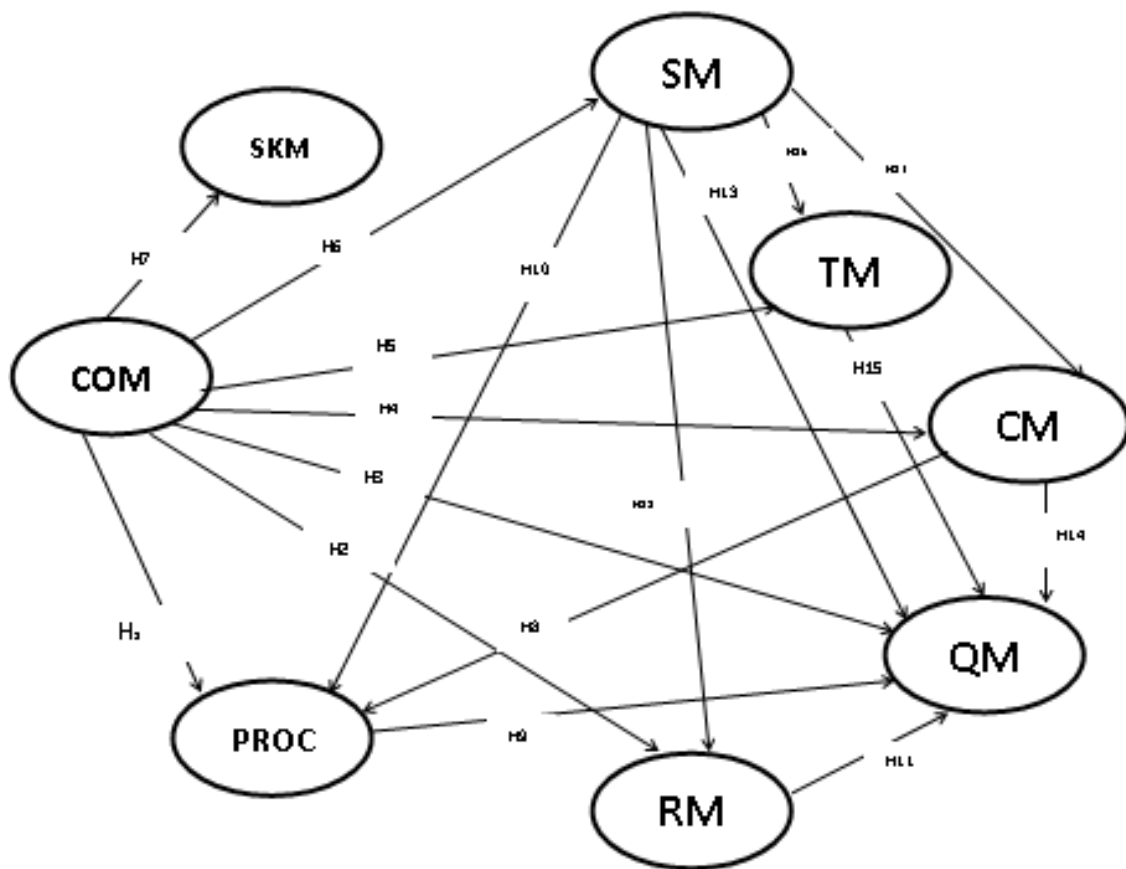


Figure 1. Hypothetical SEM Model

SIMPLIS Syntax  
 Latent Variables CMTM RM COM PROCSM SXMQM  
 Relationships  
 SXM =COM  
 SM =COM  
 TM =SM COM  
 CM =COM QM SM  
 QM =COM PROC SM TM RM CM  
 RM =COM SM  
 PROC =COM SM  
 X11 X12 X15 =SM  
 X21 X22 X23 =TM  
 X31-X33 =CM

X42 X43 X44 =QM  
 X51 X52 X55 X56 =RM  
 X72 X73 X75 =COM  
 Set the errors of X72 X73 X75 free  
 X81 X84 X85 =PROC  
 X91 X92 X93 =SXM  
 Path Diagram  
 End of Problem

The summary of the research methodology adopted for the study is as represented in the flowchart in Figure 2.

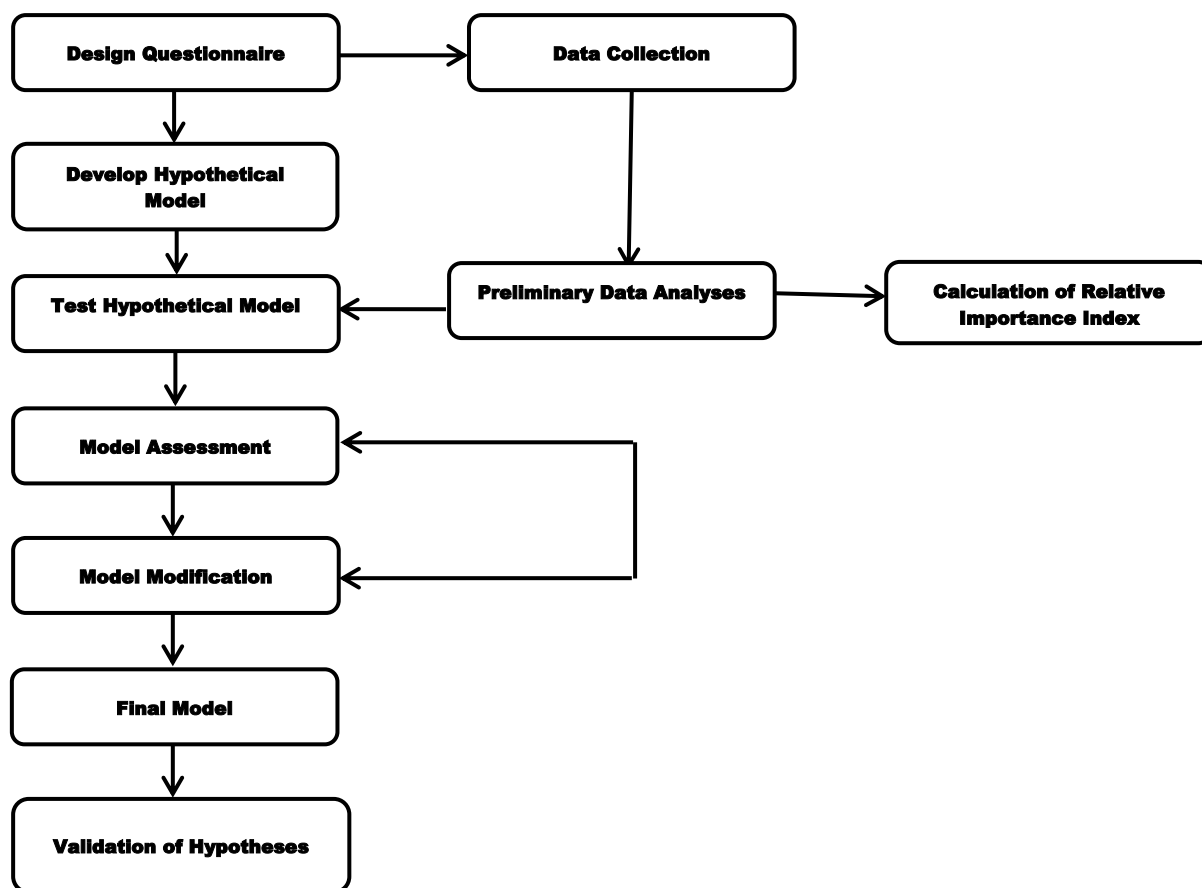


Figure 2. Flowchart for the Research Methodology

#### 4. RESULTS

The number of valid questionnaires used for data analysis was two hundred and twenty one which signifies a high and acceptable response rate of 88%. Also, in accordance with the recommendation of Chou and Yang (2012), the majority of the respondents (61%) were Civil and Structural Engineers basically because they execute the bulk of the construction project activities. The usability of the responses from the respondents for data analysis was further justified by the fact that 72% of them have a minimum of 5 years work experience in managing construction projects and at least a degree in their respective field as stipulated by Hwang and Liu, (2013). All the sampled construction companies have been in the construction industry for the past 10 years with each handling on the average a total of 5 projects per annum.

Only 22% of the respondents have professional certification in project management while the rest operated based on formal training and experience.

#### 4.1 The Relative Importance of the Project Management Practices

The result of the calculation of the relative importance index of the project management practices which indicates their level of utilization in construction projects by the respondents was shown in Table 3 with 0.712 being the highest value and 0.331 the lowest. Out of the 53 project management practices used for the data analysis, only three had values less than 0.6. This indicates that on a general note that the level of utilization of the project management practices in the construction companies is above average.

Table 3. Relative Importance of the Project Management Practices

Variables	Strongly Agree(5)	Agree(4)	Neutral(3)	Disagree(2)	Strongly Disagree(1)	Total	N	A*N	RI
X11	170	380	45	138	8	741	221	1105	0.671
X12	95	292	30	194	22	633	221	1105	0.573
X13	130	284	54	174	19	661	221	1105	0.598
X14	165	360	42	134	17	718	221	1105	0.65
X15	140	404	42	134	11	731	221	1105	0.662
X16	155	388	57	138	5	743	221	1105	0.672
X17	165	412	39	136	4	756	221	1105	0.684
X21	185	408	27	136	5	761	221	1105	0.689



**Table 3.** Relative Importance of the Project Management Practices (continued)

Variables	Strongly Agree(5)	Agree(4)	Neutral(3)	Disagree(2)	Strongly Disagree(1)	Total	N	A*N	RI
X22	205	396	36	116	11	764	221	1105	0.691
X23	180	380	63	126	6	755	221	1105	0.683
X24	155	360	66	142	7	730	221	1105	0.661
X25	165	416	12	140	10	743	221	1105	0.672
X26	180	368	66	130	6	750	221	1105	0.679
X27	195	420	24	124	7	770	221	1105	0.697
X31	165	452	9	130	7	763	221	1105	0.69
X32	160	436	15	136	7	754	221	1105	0.682
X33	180	32	21	126	7	366	221	1105	0.331
X34	180	460	15	126	2	783	221	1105	0.709
X41	200	436	18	118	7	779	221	1105	0.705
X42	220	416	21	116	8	781	221	1105	0.707
X43	160	468	18	122	5	773	221	1105	0.7
X44	190	392	42	140	1	765	221	1105	0.692
X45	175	424	24	132	6	761	221	1105	0.689
X46	160	404	42	140	4	750	221	1105	0.679
X51	180	400	45	128	6	759	221	1105	0.687
X52	185	412	42	126	4	769	221	1105	0.696
X53	175	388	48	138	4	753	221	1105	0.681
X54	160	448	33	126	3	770	221	1105	0.697
X55	230	420	9	122	6	787	221	1105	0.712
X56	230	396	30	122	5	783	221	1105	0.709
X61	175	424	24	136	4	763	221	1105	0.69
X62	180	428	21	134	4	767	221	1105	0.694
X63	175	436	27	124	6	768	221	1105	0.695
X64	175	436	18	124	9	762	221	1105	0.69
X65	195	432	12	128	6	773	221	1105	0.7
X66	220	420	21	118	6	785	221	1105	0.71
X67	240	384	18	128	7	777	221	1105	0.703
X71	180	400	39	128	8	755	221	1105	0.683
X72	170	360	48	142	10	730	221	1105	0.661
X73	165	400	45	130	8	748	221	1105	0.677
X74	170	416	18	140	7	751	221	1105	0.68
X75	200	432	9	122	9	772	221	1105	0.699
X81	215	416	18	126	5	780	221	1105	0.706
X82	220	404	18	134	3	779	221	1105	0.705
X83	150	440	39	128	4	761	221	1105	0.689
X84	195	424	15	130	6	770	221	1105	0.697
X85	180	428	33	128	3	772	221	1105	0.699
X86	180	412	48	126	3	769	221	1105	0.696
X91	195	388	57	122	5	767	221	1105	0.694
X92	170	444	36	124	2	776	221	1105	0.702
X93	195	424	30	122	15	786	221	1105	0.711
X94	175	404	39	132	6	756	221	1105	0.684
X95	180	396	48	132	4	760	221	1105	0.688

The ranking of the project management practices as shown on Table 4 indicates that the first 20 most important practices have a relative importance index value greater than 0.698. These practices cut across all the knowledge areas used for the study with the exception of scope management. Procurement management has 5

practices, risk management has 4 practices, quality management and human resource management each has 3 practices, communication management has 2 while time management, cost management and stakeholder management each has 1 practice.

**Table 4.** Ranking of the Project Management Practices

SN	Variables	RI	Rank
1.	Planning risk response	0.712	1
2.	Communication methods	0.711	2
3.	Project performance appraisal	0.71	3
4.	Cost control	0.709	4
5.	Risk control	0.709	4
6.	Estimation of cost of quality	0.707	6

**Table 4.** Ranking of the Project Management Practices (continued)

SN	Variables	RI	Rank
7.	Make-or-buy analysis	0.706	7
8.	Cost-benefit analysis	0.705	8
9.	Market research	0.705	8
10.	Interpersonal skills of managers	0.703	10
11.	Planning stakeholder management	0.702	11
12.	Cause-effect diagrams	0.7	12
13.	Project development	0.7	12
14.	Reporting performance	0.699	14
15.	Inspection and audit	0.699	14
16.	Schedule control	0.697	16
17.	Quantitative risk analysis	0.697	16
18.	Review of procurement performance	0.697	16
19.	Risk identification	0.696	19
20.	Payment and records management system	0.696	19
21.	Negotiation	0.695	21
22.	Interacting system	0.694	22
23.	Stakeholder analysis	0.694	22
24.	Control charts	0.692	24
25.	Activity definition	0.691	25
26.	Cost management plan	0.69	26
27.	Use of organizational charts	0.69	26
28.	Pre-assignment	0.69	26
29.	Planning schedule management	0.689	29
30.	Performance of quality assurance	0.689	29
31.	Project evaluation technique	0.689	29
32.	Information management system	0.688	32
33.	Risk management plan	0.687	33
34.	Variance analysis	0.684	34
35.	Interpersonal and management skills	0.684	34
36.	Sequencing activities	0.683	36
37.	Usage of Communication technology	0.683	36
38.	Cost estimation	0.682	38
39.	Qualitative risk analysis	0.681	39
40.	Information management system	0.68	40
41.	Schedule development	0.679	41
42.	Statistical analysis	0.679	41
43.	Communication methods and models	0.677	43
44.	Work Breakdown Structure (WBS)	0.672	44
45.	Estimating the duration for activities	0.672	44
46.	Scope management plan	0.671	46
47.	Alternative identification	0.662	47
48.	Estimating the resources for activities	0.661	48
49.	Communication requirement analysis	0.661	48
50.	Scope variation	0.65	50
51.	Clarity of scope definition	0.598	51
52.	Scope requirements collection	0.573	52
53.	Budget determination	0.331	53

**4.2 Preliminary Data Analyses for SEM (EFA, Cronbach’s Alpha, AVE and CR)**

The result of the EFA for reduction of the variables used for the SEM is shown in Table 5 which resulted in the elimination 27 variables based on factor loadings greater than 0.500 (Karl et al., 2016). As a result of this, only 26 measurement or observed variables were used for the SEM.

**Table 5.** Exploratory Factor Analysis

Variables	Factor Loading
X11	.746
X12	.733
X13	.482
X14	.447
X15	.698
X16	.483
X17	.317
X21	.728
X22	.718
X23	.714
X24	.479

**Table 5.** Exploratory Factor Analysis (continued)

Variables	Factor Loading
X25	.390
X26	.470
X27	.693
X31	.656
X32	.654
X33	.708
X34	.452
X41	.480
X42	.704
X43	.721
X44	.742
X45	.478
X46	.472
X51	.731
X52	.711
X53	.418
X54	.475
X55	.756
X56	.796
X61	.404
X62	.401
X63	.455
X64	.474
X65	.426
X66	.358

X67	.466
X71	.456
X72	.747
X73	.774
X74	.482
X75	.760
X81	.741
X82	.468
X83	.402
X84	.744
X85	.761
X86	.703
X91	.708
X92	.729
X93	.487
X94	.409
X95	.369

The preliminary data analyses for validity and reliability tests were calculated based on only the retained 26 measurement variables. The results are shown in Table 6 with only one construct having a value below 0.6 for the reliability test. Based on this, the human resource management construct and associated variables were removed from the SEM model. The rest of the constructs scaled through the reliability and validity tests.

**Table 6.** Reliability and Validity Tests for Constructs

SN	Construct Label	(a)	CR	AVE
1	SM	0.778	0.893	0.655
2	TM	0.865	0.886	0.631
3	CM	0.875	0.869	0.721
4	QM	0.849	0.862	0.627
5	RM	0.887	0.885	0.715
6	HRM	0.875	0.787	0.361
7	COM	0.869	0.876	0.795
8	PROC	0.876	0.864	0.647
9	SKM	0.827	0.895	0.732

### 4.3 The Relationships between the Project Management Practices (SEM)

The hypothesized SEM model for the relationships between the project management practices was tested in LISREL to get the experimental model in Figure 3. This was subjected to modification based on the suggestions from the computing device in LISREL. Further modification did not improve the goodness of fit statistics, hence the experimental model was accepted since the GOF values are within acceptable range. The validated, rejected and changed hypotheses are shown in Table 8 alongside their path coefficients, while Table 7 shows the GOF statistics.

**Table 7.** Goodness of Fit Indices

SN	GOF	Experimental Model
1	X <sup>2</sup> /df	2.45
2	NNFI or TLI	0.95
3	CFI	0.96
4	RMEA	0.080

**Table 8.** Validated Hypotheses

Hypotheses	Validated	Rejected	Changed	Path Coefficient
1	Yes			0.68
2	Yes			0.60
3	Yes			0.38
4	Yes			0.65
5	Yes			0.61
6	Yes			1.22
7	Yes			0.83
8	Yes			-0.42
9	Yes			0.42
10			Yes	-0.21
11			Yes	-0.22
12	Yes			0.45
13			Yes	-0.26
14			Yes	-0.63
15		Yes		
16	Yes			0.55
17	Yes			0.83

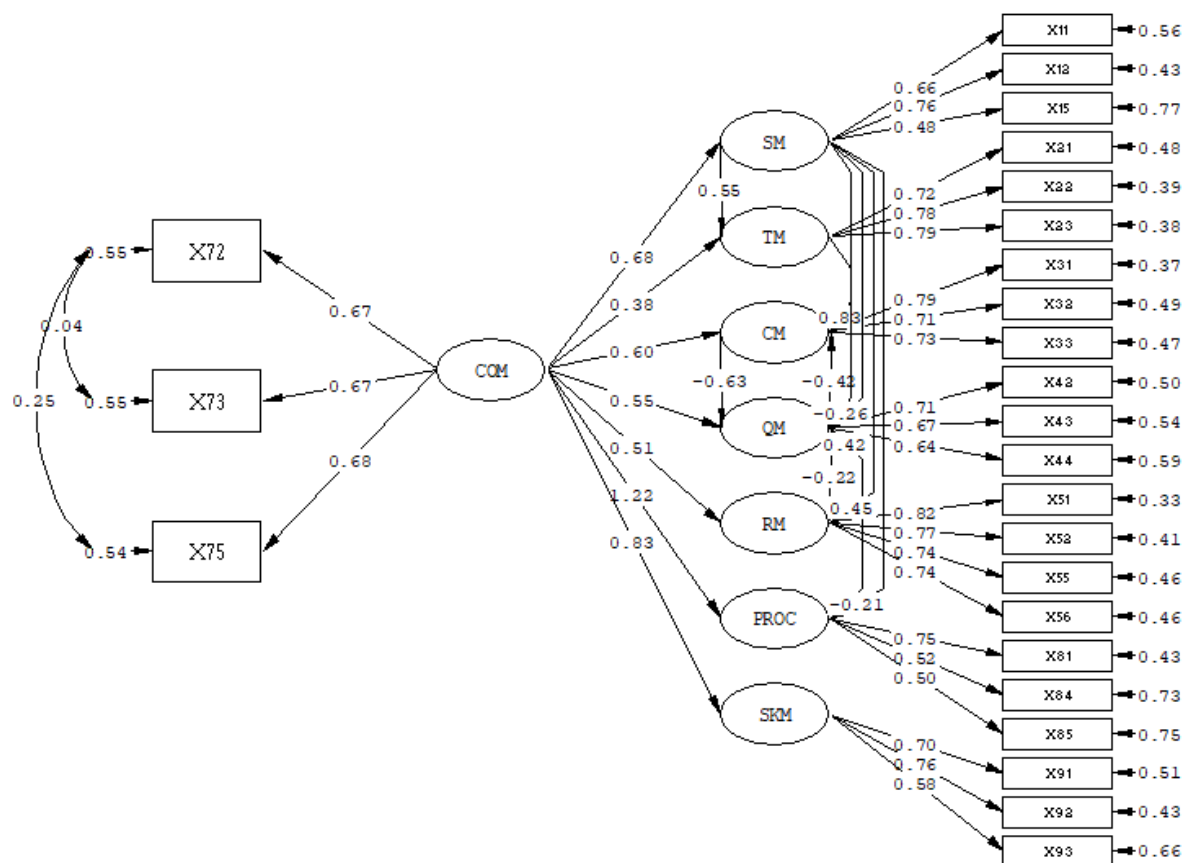


Figure 3. The Experimental SEM Model

## 5. DISCUSSION

### 5.1 Professional Certification and Relative Importance Index

The management of construction projects is a challenging and evolving issue because of the dynamism of the multivariate that impact project success which in turn is multidimensional in nature. To facilitate the realization of the objectives of a project and promote project success, the right project management practices should be adopted by project management professionals. A project that is not managed effectively will likely be overwhelmed by these multivariate and lead to project failure or poor performance. This makes it imperative for project management personnel to be properly trained on contemporary project management practices and for construction companies to adopt standard best practices in the management of their projects.

This study reveals that there is poor emphases on the project management certification of the professionals in the construction companies. This was highlighted by the 22% of the 221 professional surveyed having at least a certification in project management. This indicated that the majority of the respondents know only the basics or fundamentals of project management. In order words, many of the professionals cannot effective use contemporary project management methods, tools and techniques in project management to produce the kind of

result required of an expert with professional certifications. Although pursuing a project management professional certification is a challenging task especially because of the time and resources required to acquire one, the gains are quite enormous for both the professional and the project organization. It is worth pointing out that in most developed countries, project organizations encourage their professionals in project management to go for not just one professional certification but multiple certifications because they understand that project management is dynamic and ever evolving.

Looking at the level of importance of the project management practices to the construction companies as indicated by their relative importance index, the respondents agreed that the use of project management practices enhance project performance. In this contemporary era, a construction company's performance and competence is to a large extent determined by their level of application of standard project management practices in the management of their projects. This by extension depends on the level of skilled project management personnel they have at their disposal. The values of the relative importance index also indicates that there is need for improvement in the utilization of these practices in managing construction projects in the companies. This is because the highest value of the relative importance index was 0.712. It is not out of place to get values higher than 0.8 which indicates excellent utilization.

The first 20 most important project management practices cut across 8 of the project management knowledge areas used for the study with the exception of scope management. This however did not translate to the negligence of scope management process by the construction companies in the management of their projects because all the variables under scope management had acceptable relative importance value which indicates that they were viewed as important in effectively implementing project management. The least important project management practice (determination of budget) is generally viewed in project management as a very important practice. This indicates that there is poor budgeting for construction projects by the construction companies. This is supported by the recorded cases of abandoned or failed construction projects in Nigeria as highlight earlier in the introduction section. When a project is poorly budgeted, the company may be tempted to cut cost which may result to poor performance. Alternatively, the company may suspend the project while seeking to renegotiate with the clients. This may eventually result to project delay or outright abandonment of the project.

## **5.2 Relationship between the Project Management Practices**

Table 8 reveals that 11 hypotheses were validated, 5 changed from positive to negative impact and 1 was rejected. The first seven hypotheses (H1-H7) were validated indicating that communication management positive influences scope management, time management, cost management, quality management, risk management, procurement management and stakeholder management. This implies that effective communication management is critical and central to the effective application of project management practices in a project. This result also reveals that the elements of communication in the other project management knowledge areas should be harnessed for successful project management. The relationship between procurement management and quality management (H9) was validated indicating that effective procurement management positively impacts management of the project quality. Thus, improving procurement management results in improved quality. The validation of hypotheses 12 (H12) indicates that scope management positively influences risk management. This agrees with the fact that a clear understanding and management of the project scope helps the project team to identify associated risks and plan for measures to respond and mitigate them with minimum impact on the project outcome. The impacts of scope management on time and cost management (H16 and H17) were found to be positive, which implies that effective scope management has the capacity to improve the management of the project cost and time. This also will enable the project team to eliminate wastage of time and resources.

The first hypothesis that was changed (H8) indicates that cost management negatively influences procurement management. This implies that an improvement in the management of project cost will negatively impact project procurement management. This hypothesis was dropped because it is not in accordance with project management best practices. Hypothesis 10, 11 and 13 were also dropped on the same ground having respectively indicated that effective scope management negatively influences procurement management, risk management negatively influences quality management, and scope management negatively influences quality management. However, the change on hypothesis 14 which indicates that cost management negatively influences quality management was accepted. This is based on the fact that effectiveness in the management of project cost could result in compromising the quality especially in the context of developing countries. Hence the need to put the desired quality of the project output in perspective when managing project cost. The positive impact of time management on quality (H15) was rejected because the path failed to connect during the SEM modelling process.

The implication of these results to management is that measures should be put in place to ensure that the project management personnel are well trained in the project management practices and there interaction with each other. The skillfulness of the project management personnel in the practices of one or two project management knowledge area will definitely not be adequate since there is a high level of interaction between them. This agrees with the findings in the maturity of project management practices in a project organization which showed that even though a project organization may have a high maturity in one of the knowledge areas, the fact that it has any of the knowledge areas at a low level seals the overall project management maturity model for the organization at that lower level (Yen et al., 2016). The management of project organization should emphasize effective communication throughout the project lifecycle since it has been proven to be critical to the effectiveness of the other project management practices.

## **6. CONCLUSION**

The management of construction projects is a challenging issue because of the number and nature of the variables that influence project management. Since project management demands the application of tools, methods and techniques to project activities in order to realize the expected outcome, it is essential for the professionals in project management to be well equipped and experienced in their usage. Because of the retrogressive nature of development in developing countries the project management practices adopted by their construction companies tend to be out of line with contemporary issues in project management. This research study focused on identifying the relative

importance, usage and relationships of the project management practices in the construction companies in Nigeria. A total of 53 project management practices selected from 9 project management knowledge areas were used to collect data from 250 respondents with at least five years of work experience in the construction industry.

The result of the data analyses indicates that only 22% of the respondents have at least a professional certification in project management. This implies that the construction companies did not place emphasis on the certification of their project management personnel. The reviewed literatures pointed out that there is a link between professional certification in project management and the skillfulness of project management personnel in managing projects using best project management practices. A project management personnel with certification is better equipped to confront project management challenges and deliver project outcome.

The result also indicates that the respondents agreed that the utilization of project management practices in project management enhances project success. All but one of the project management practices were deemed relevant for the management of construction projects. This agrees with the fact that the right application of the project management tools, methods and techniques in the management of construction projects will promote project success. The fact that the highest value of the relative importance index was 0.712 indicated that there is still room for improvement in the utilization of project management practices by the construction companies. The respondents also pointed out that budget determination was not adequately handled as indicated by the poor value of the relative importance index. This could be one of the root cause of poor project

performance and project abandonment in the country. Poor budgeting of construction projects will definitely result in cutting of cost at the expense of the expected project outcome or abandonment if renegotiation fails. Furthermore, the study reveals that communication management positively impacts the effectiveness of the other project management knowledge areas. Hence emphasizing the need for the project organization to harness every element of communication in these knowledge areas and foster effective communication throughout the project lifecycle. Application of contemporary communication management systems, tools and techniques is highly recommended. The study also highlighted the need to put quality management in perspective when managing project cost in order to prevent a compromise of the quality when managing cost.

The result of this study was obtained from sampled indigenous construction companies in Nigeria which is a developing nation. Therefore, it will a good recommendation for more research studies to be carried out in other developing nations and the results of the research findings be compared. The result of this research indicates that there is need for construction companies in developing countries to encourage their project management personnel to go for project management certification by supporting them financially and giving room for professional development. This will enhance their skillfulness in project management and application of best practices. It is also imperative for the construction companies to improve their budgeting strategies for their projects by applying appropriate methods and techniques. This will ensure the maintenance of a balance between cutting of cost and realization of project outcome.

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