

## **A STUDY OF MAJOR STAKEHOLDERS' PERCEPTION ON COST ESTIMATE FACTORS FOR CIVIL ENGINEERING PROJECT IN NIGERIA**

**Akinmusire, A.O**

Quantity Surveying Department,  
Rufus Giwa Polytechnic, Owo,  
Ondo State, Nigeria.

**Ologunagba, M.M**

Quantity Surveying Department,  
Rufus Giwa Polytechnic, Owo,  
Ondo State, Nigeria.

### **Abstract**

*The interest of whom Quantity Surveyors and Civil/Structural Engineers represent dictate their disposition to civil engineering project cost estimate factors, although it does not lead to either total agreement or disagreement. The opinion of these professionals was captured under the umbrella of client, consulting and contracting via the data gathered by means of questionnaire, which was analysed using percentile, frequency distribution table and relative importance index. The average year of experience and number of civil engineering projects handled by the Quantity Surveyors and Civil/Structural Engineers was considerably high. Hence, they were familiar with the various factors usually adopted in the determination of civil engineering project cost estimate. However, Quantity Surveyors and Civil/Structural Engineers attached both same and different degree of importance to civil engineering project cost estimate factors by showing that some of the factors were important at same measure while some at different measures. Besides, the consensus opinion of client, consultant and contractor in respect of factors enhancing the effectiveness of civil engineering project cost estimate was also at variance. Therefore, it was concluded that client, consultant and contractor expressed both convergent and divergent views as far as cost estimate factors for civil engineering project is concerned including its cost effectiveness enhancing factors. Consequently, it was recommended that construction site condition and climatic condition be prioritized while estimating the cost of civil engineering project and to achieve effectiveness of the cost.*

Keywords – Client, consultant, contractor, perception, cost estimate factors, civil engineering project

### **Introduction**

The construction industry is particularly concerned with provision of buildings and infrastructures which are obviously products of building, civil engineering and heavy/industrial engineering categories of construction projects (Akinmusire and Ariyo, 2009). However, development of construction project of whatever type involves participation of numerous parties (Takim and Akintoye, 2002). These include clients, contractors, consultants, shareholders and regulators as stated in the work of Adnan, Sherif and Saleh (2009) and Navon (2005) cited in Akinmusire and Ologunagba (2016). In line with this, Eshofonie (2008) identified client, consultant and contractor as major construction project stakeholders who participate in construction project realisation. These project participants often get involved in construction project with specific objective/goal, which may be dictated by the nature of the organisation. Hence, Akinmusire and Ologunagba (2016) opined that project participants' objective/goal need not be the same despite their involvement in a given

project. Furthermore, Akinmusire (2015) submitted that Quantity Surveyors and Civil/Structural Engineers were essential key players in achieving a successful civil engineering project. These professionals, who are usually of different rank, get involved in project realization process by acting in different capacity.

However, cost estimating of a construction project is a preliminary exercise carried out to determine the cost of the project taken appropriate estimating factors and data into consideration. In some cases, cost estimating is done as work progresses for the purposes of determining the actual cost of work originally included in the bill of quantities for the project or for contingently necessary work occasioned by variation. For civil engineering project, the responsibility for carrying out cost estimating exercise rests upon the consultant Quantity Surveyor or Engineer on behalf of a client (Odusami and Onukwube, 2013). According to literatures, an estimate can generally fall into three dimensions, which includes accurate, low or high, depending on the data used, estimating factors adopted and experience of the estimator. Consequently, the success or failure of a project is dependent on the accuracy of several estimates done throughout the course of the project. Therefore, preparation of a cost estimate of a project is one of the most difficult tasks in construction project realisation because it must be done before work is accomplished. Previous researches traced the accuracy or otherwise of a contractors' tender to non-utilisation of appropriate cost estimate factors during tendering process. This was believed to be a reason why some contractors, in most cases, are not favoured by prospective clients. Moreover, economical project cost can only be achieved if an estimate is accurate. On the other hand, either an under estimation or an over estimation often brings about over expenditures.

Moreover, the capital intensive nature of civil engineering projects is usually due to their complexities and the technicalities required to put them in place. As a result of this, it becomes pertinent for many civil engineering professionals to be involved in their planning and construction. On the part of the professionals, not applying adequate cost information, that is capable of enhancing production of the project, often lead to the client paying more than the predetermined estimate. Consequently, the fact still remains that an estimate should truly reflect the scope of work despite the risks in civil engineering project, which has been the object of attention because of time and cost overrun associated with projects.

### **Aim and Objectives**

This research focuses on major stakeholders' perception on cost estimate factors of civil engineering project in Nigeria with a view to drawing comparison in respect of the importance attached to the factors by client, consultants and contractor. The objectives are:

1. to examine client's, consultant's and contractor's perception on civil engineering project cost estimate factors
2. to evaluate client's, consultant's and contractor's view on factors responsible for effective civil engineering cost estimate

### **Review of related literature**

The construction industry provides the platform for client, consultant and contractor, who Eshofonie (2008) regarded as major construction project stakeholders, to come together at the beginning of a project and disengage at the end of the project. These stakeholders obviously perform distinct functions ranging from project initiation through designing to construction and supervision as well as financing. According to Barbara (2004), the construction industry is a conglomerate of building industry, civil engineering industry and heavy/industrial engineering industry. Considering this, Houghton (2004) defined civil engineering as

professional engineering discipline that deals with the design, construction and maintenance of physical and naturally built environment, comprising works like roads, bridges, canals, dams and buildings. Civil engineering works are peculiarly distinguished by type, nature, complexity and resources requirements (Lake, 2008, cited in Akinmusire 2015). Therefore, Barbara (2004) stated that civil engineering project requires special engineering skill and know how to execute. However, civil engineering projects come into existence in form of structures and buildings of different types, shapes and complexity. Projects in this category has client as the initiator and financier, while design and supervision tasks rest upon the Civil/Structural Engineer. It should be noted that contractor is responsible for actual construction of civil engineering projects with Civil Engineers as prime consultants (Oforeh 2006). The study conducted by Masamitsu, Khairuddin, Toshihiko and Kiyoshi (2003) listed some peculiar factors that usually characterize civil engineering projects. These include change of design, quantity of work, material, time and cost of construction. Hence, the estimated cost of any civil engineering projects that experiences these peculiar factors usually becomes ineffective because such project would be characterized by over expenditure. Hence, failure of some projects to be completed within predetermined cost is one of the reasons why some projects were tagged unsuccessful. Meanwhile, cost was identified as a major criterion for measuring construction project performance (Oyegoke, 2008; Akinmusire and Ologunagba, 2016).

The work of Budshait and Almohawis (1994) revealed cost as the degree to which the general conditions promote the completion of a project within the estimated budget. On the other hand, cost estimating was defined as the process of forecasting the cost and price demanded by the resources needed to actualize a project in terms of scope for the purpose of managing the amount set aside for the project and ensuring that project is delivered to scope without extra expenditure (Washington State Department of Transportation, 2015). According to Akinmusire and Ologunagba (2016), consultants fixes construction project cost on behalf of the client despite their being products of different disciplines in the construction industry.

Chan and Park (2005) opined that preparation of construction cost estimate for any project is a very complex process because construction cost estimation requires taking many factors into consideration. In this case, it was suggested that every variable must to be correctly estimated based on proper study, past experience and research to calculate the total project cost of construction. Factors affecting construction cost estimate as reflected in Chan and Park (2005) include similar construction projects, which was opined to be a better reference for cost estimate of construction projects because of the ability of the final cost of those similar projects to give the idea for the new construction project cost. In this case, it was submitted that the final cost of past project needed to be factored with current construction cost indices.

Construction material cost, which consists of material cost, shipping charges and taxes (if any), was identified as another factor affecting construction cost estimate. The cost of these variables was believed to be so important to calculating construction materials cost. Labour wage rate, which varies from place to place, was also listed among the factors affecting construction project cost estimate. If a project had to be started after several months of estimating the project cost, the probable variation in wage rates had to be considered in the calculation. Furthermore, site conditions such as poor soil conditions, wetlands, contaminated materials, conflicting utilities (buried pipe, cables over head lines etc), environmentally sensitivity arena, ground water, river or stream crossings, heavy traffic, buried storage tanks,

archaeological sites, endangered species habitat and similar existing conditions, which were synonymous to construction site condition could increase construction project cost during construction phase if they were not considered during estimation. Inflation factor was opined to affect construction project cost estimate when the construction project continue for years before completion. During the construction period, it was submitted that cost of materials, tools, labors, equipments might vary from time to time. In view of this, Chan and Park (2005) posited that variation in the prices of these items should be considered during cost estimation process.

Furthermore, project schedule was enumerated among the factors affecting construction project cost estimate. In this case, it was found that increase in project duration leads to increase in construction project cost due to increase in indirect costs, while reduction in project duration also result into increase in project cost due to increase in direct costs. On the part of reputation of Engineers, literature stipulated that smooth running of constructing was vital for project to be completed within estimated timeframe. Cost of construction projects would reduce if handled by experts with sound professional reputation. The reason for this was attached to elimination of resource wastage associated with non-reputable professional. Also, a cost effective construction project would be achieved if a contractor works with a reputable engineer or engineering firm. Another cost estimate factor is regulatory requirements and approval by regulatory agencies, which could at times be costly. Therefore, costs associated with this factor were considered to be relevant and must be adopted during construction cost estimate preparation. However, insurance requirements in respect of costs of insurance for various tools, equipments, construction workers, and general insurance requirements, such as performance bond, payment bond and contractor's general liability as well as normal cost of construction projects were discovered to be essential factors needed for inclusion in construction cost estimate. The effect of insurance requirement was traced to costly estimation for construction project. Moreover, the effect of this factor becomes more pronounced where large construction project is involved. Such project was opined to require high demand for work force. For such a requirement, local workmen might not be sufficient leading to extra costs on such project especially where the type of construction project require specialized workforce.

Location of construction **project** also affect construction project cost estimate particularly when the location of construction project is far from available resources. This factor was found to contribute to increase in the cost of materials, tools and other resources demanded by the proposed project due to obvious reason of increase in distance which would eventually add to the project cost. In recognition of the relevance of engineering review, literatures depicted that it might be necessary to carry out technical review of construction project to make sure that operational and maintenance cost is achieved. In this case, it was suggested that review cost be considered during construction project cost estimation process. Contingency is another listed factor to be considered as far as construction project cost estimate is concerned. It was found that at least 10% be added as contingency to total project cost, during estimating, for unforeseen costs and inflation. Despite the existence of these factors, Washington State Department of Transportation, (2015) believed that cost estimating determination require experience, calculating and predicting future costs in respect of resources, methods and management within a scheduled time frame. Having admitted that cost estimate is a prediction, Washington State Department of Transportation (2015) suggested that cost estimate must cater for risks and uncertainties. It therefore, advocated

monitoring and putting on record, changes made to project in respect of cost as well as scope and schedule including all assumptions as a reference for future estimates.

The research conducted by Rathsayam (2009) and Le (2011) and Sameh (1998) cited in Adedokun, Akinmusire and Aje (2016) admitted the difficulty in achieving construction projects within the initial cost fixed by client and consultants as a result of uncertainties characterizing construction projects among other factors. Without mincing words, ability of construction project cost to meet expected target determines its effectiveness. Hence, construction projects completed by extra spending failed in terms of meeting targeted cost. From literatures achievement of effective cost estimate depends on a number of factors. These include climatic condition, project manager’s coordinating and leadership skills, project manager’s competence, and monitoring and feedback by participants. Other factors, such as economic condition, top management supports, decision making coordination among project participants, and social condition were also admitted among the factors influencing effectiveness of construction project cost estimate.

**Methodology**

This study was carried out by sampling the opinion of qualified professionals, such as Quantity Surveyors, Civil/Structural Engineers in client, consulting and contracting organisations engaging in civil engineering projects. This was done in line with the result in Akinmusire (2015), which established the relevance of Quantity Surveyors and Civil/Structural Engineers in civil engineering project. The primary data used was provided by Registered Quantity Surveyors and Civil/Structural Engineers through a well structured questionnaire requiring respondents to score all the variables in a 5 – point Likert scale while those connected with background information required ticking right. The collected data was analysed using relative importance index (RII) while those in respect of background information were analysed using percentile and frequency distribution table. This was aimed at determining the degree of the importance attached to each cost estimate factor by each respondent under the categories of client, consultant and contractor relative to civil engineering project. The relative importance index formula, shown below, was used.

$$\text{Relative Importance Index (RII)} = \frac{\sum_{i=1}^5 W_i X_i}{\sum_{i=1}^5 X_i} \dots\dots\dots(3)$$

**Where:**

W<sub>1</sub> = weight assigned to ith response; w = 1, 2, 3, 4 and 5 for i = 1, 2, 3, 4 and 5 respectively

X<sub>1</sub> = frequency of ith response

i = response category index = 1, 2, 3, 4 and 5 for very low, low, moderate, high and very high respectively.

The result of the relative importance index (RII) was arranged in their order of magnitude beginning with the largest to the smallest and ranked in case of objective two. This became necessary because it focused on consensus opinion of the respondents while that of objective one did not follow suit because it was individualistic. However, the assessment levels shown in the table below was adopted in order to establish the compactness of major stakeholders’ perception on the listed factors and thus formed the basis for comparison.

**Table 1 - Relative importance Index assessment levels, grades and rating**

---

<b>Level</b>	<b>Grade</b>	<b>Assessment rating</b>
0.00 - 0.10	Extremely low	Extremely less important
0.11 - 0.20	Very low	Pen-ultimate less important
0.21 - 0.30	Moderately low	Moderately less important
0.31 - 0.40	Low	Less important
0.41 - 0.50	Somewhat low	Somewhat less important
0.51 - 0.60	Somewhat high	Somewhat important
0.61 - 0.70	High	Highly important
0.71 - 0.80	Moderately high	Moderately important
0.81 - 0.90	Very high	Very important
0.91 - 1.00	Extremely high	Extremely important

## **Results**

### **Background**

This aspect presents background information in respect of questionnaire distribution details, respondents' years of experience and their involvement in civil engineering project. Table 2 reflect questionnaires distribution and retrieval details showing that a total of four hundred and fifty (450) questionnaires were distributed to various respondents comprising professional Quantity Surveyors and Civil/structural Engineers in client, consultants and contracting organisations. Over 90% of the questionnaires distributed to the various categories of respondents were retrieved. This response rate is very high, signaling a reliable result. Hence, the four hundred and twenty five (425) questionnaires retrieved, which gave a retrieval rate of 94.44%, were fully completed and analysed having found it suitable for analysis.

**Table 2 - Questionnaire distribution details**

<b>Organisation category</b>	<b>No. distributed</b>	<b>No. retrieved</b>	<b>Retrieval %</b>
Client	60	55	91.67
Consulting	110	102	92.73
Contracting	280	268	95.71
<b>Total</b>	<b>450</b>	<b>425</b>	<b>94.44</b>

From table 3, the years of experience of majority (186) of the respondents is between 0 and 10 years while few (4) of the respondents had spent between 40 and 50 years in their respective organisations. The result shows that the number of responses decreases as the years of experience increases, indicating that those with advanced length of time in their respective profession are no longer in the organizations probably as a result of setting up their own businesses or any other reason. However, the average year of experience of all the respondents is about 15 years. This is remarkably high and considered adequate to establish the reliability of the data provided by them.

**Table 3 - Years of experience of respondent**

<b>Response</b>	<b>F</b>	<b>X</b>	<b>FX</b>
0 – 10	186	5.50	1023.00
11 – 20	115	15.50	1782.50

21 – 30	85	25.50	2167.50
31 – 40	35	35.50	1242.50
41 – 50	4	45.50	182.00
<b>Total</b>	<b>425</b>		<b>6397.50</b>

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{6397.50}{425} = 15.05 = \mathbf{15 \text{ years}}$$

In order to establish the degree of involvement of the respondents in civil engineering project, they were asked to indicate the number of projects handled in the range stated in the questionnaire. The result, shown in Table 4 reveals that the respondents had been involved in a considerable number of projects since inception. Majority (132), representing not less than 31% of the respondents, were involved in between 0 and 10 projects while few (15) representing about 4% of the respondents registered their involvement in civil engineering project in the region of 41 and 50 projects. However, the average number of projects handled by the respondents is estimated at about 18. This is reasonably high and considered appropriate to justify the eligibility of the respondents to bear their views in respect of this study.

**Table 4 - Number of project handled since inception**

<b>Project number</b>	<b>F</b>	<b>X</b>	<b>FX</b>
0 – 10	140	5.00	700.00
11 – 20	112	15.50	1736.00
21 – 30	110	25.50	2805.00
31 – 40	35	35.50	1242.50
41 – 50	28	45.50	1274.00
<b>Total</b>	<b>425</b>		<b>7757.50</b>

$$\text{Mean} = \frac{\sum fx}{\sum f} = \frac{7757.50}{425} = 18.25 = \mathbf{18 \text{ projects}}$$

**Perception on cost estimate factors for civil engineering project**

This section provides the result of the analysis carried out in order to study Quantity Surveyors’ and Civil/Structural Engineers’ perception on civil engineering project cost estimate factors including the factors that can contribute to its effectiveness. Table 5 reflect the importance ascribed to civil engineering project cost estimate factors as perceived by respondents bearing their views from client, consultants and contractor perspectives. The relative importance index (RII) of construction site condition ranges between 0.71 and 0.80 for all categories of respondents. This is moderately high by virtue of the assessment rating designed for this study with same degree of importance attached to this factor by the respondents. Also, type of construction project polled relative importance index in the region of 0.71 and 0.80 for client and contractor groups of respondents while that of consultants' side is in the region of 0.81 and 0.90. The degree of importance accorded this factor is moderately high as opined by client and contractor while consultants rated it very high. This shows that type of construction is more important to consultants than client and contractor as far as cost estimate factor of civil engineering project is concerned. In case of construction material, result reveals its relative importance index at 0.76 and 0.75 for client and contractor respectively. This falls between 0.71 and 0.80 of assessment range meaning that this factor

was rated moderately high by client and contractor compared to its relative importance index (0.66) which ranges between 0.61 and 0.70, showing that it was perceived to be highly important by consultants.

The result also depict that the relative importance index of construction project size is 0.74, 0.77 and 0.74 while that of location of construction site is 0.74, 0.76 and 0.74 for client, consultants and contractor respectively. These falls within 0.71 and 0.80 relative to the assessment range in each case. This reflects that client, consultants and contractor agreed that these factors are moderately important while estimating the cost of civil engineering project. Similar construction project polled relative importance index of 0.73 and 0.71 for consultants and contractor, falling in the region of 0.71 and 0.80 of assessment range. This indicate an agreement between consultants and contractor that similar construction project is a moderately important factor to cost estimate of civil engineering project. On the other hand, this factor emerged as highly important to client with a relative importance index of 0.70. The relative importance index of insurance requirement (0.73), inflation factor (0.73) and contingency (0.71) for consultants is moderately high while that of client (0.69, 0.69 and 0.68) and contractor (0.65, 0.68 and 0.68) is high. This result shows that these three factors are moderately important to consultants but highly important to client and contractor. Similarly, project schedule is considered to be a moderately important cost estimate factor for civil engineering project by both consultants and contractor having polled a relative importance index of 0.71 and 0.71 respectively. Contrarily, the relative importance index of this factor is 0.68 for client indicating that it is believed to be highly important. Moreover, the relative importance index of engineering review (0.66, 0.70 and 0.66) and labour wage rate (0.65, 0.70 and 0.67) is high, showing that client, consultants and contractor opined that these factors are highly important to cost estimate of civil engineering project. In like manner, the relative importance index of reputation of engineer (0.64, 0.69 and 0.64) and regulatory requirement (0.63, 0.66 and 0.63) for client, consultants and contractor respectively is also high. This means that these factors are highly important to cost estimate of civil engineering project according to major stakeholders' rating.

**Table 5 - Perception on civil engineering cost estimate factors**

Estimating Factors	Relative Importance Index (RII)		
	Client	Consultant	Contractor
Construction site condition	0.79	0.80	0.79
Type of construction project	0.79	0.82	0.77
Construction material cost	0.76	0.66	0.75
Size of construction project	0.74	0.77	0.74
Location of construction project	0.74	0.76	0.74
Similar construction project	0.70	0.73	0.71
Insurance requirement	0.69	0.73	0.65
Inflation factor	0.69	0.73	0.68
Contingency	0.68	0.71	0.68
Project schedule	0.68	0.71	0.71
Engineering review	0.66	0.70	0.66
Labor wage rate	0.65	0.70	0.67
Reputation of engineer	0.64	0.69	0.64
Regulatory requirement	0.63	0.66	0.63



However, table 6 reflect the outcome of the data obtained as a result of the question posted in order to assess the consensus opinion of major civil engineering project stakeholders on factors perceived to be responsible for effectiveness of civil engineering project cost estimate. In this case, climatic condition ranked first (1) among the listed factors with relative importance index of 0.84. This is followed by project manager’s coordinating and leadership skills which ranked second (2) with relative importance index estimated at 0.73. Furthermore, project manager’s competence (0.72), monitoring and feedback by participants (0.70) and economic condition (0.72) ranked third (3) while top management support and decision making coordination among project participants ranked sixth (6) and seventh (7) with relative importance index of 0.71 and 0.70 respectively. The relative importance index of social condition is estimated at 0.69 thereby ranking eighth (8) in the table.

Going by the assessment rating designed for this study, the relative importance index of climatic condition falls between 0.81 and 0.90, indicating that this factor is very important to achieving effective cost estimate of civil engineering project. Despite the difference in the ranking position of project manager’s coordination and leadership skill, project manager’s competence, monitoring and feedback by participants, economic condition and top management support in the ranking order, they were all considered to be moderately crucial to effectiveness of cost estimate of civil engineering project by ranging between 0.71 and 0.80 in the assessment rating. In same vein, the relative importance index of decision making coordination among project participants and social condition ranges between 0.61 and 0.70 of the assessment rating, showing that they were perceived to be highly essential to achieving effective cost estimate of civil engineering project.

**Table 6 – Factors enhancing the effectiveness of civil engineering cost estimate**

<b>Variables</b>	<b>RII</b>	<b>Rank</b>
Climatic condition	0.84	1
Project manager’s coordinating and leadership skills	0.73	2
Project manager’s competence	0.72	3
Monitoring and feedback by participants	0.72	3
Economic condition	0.72	3
Top management supports	0.71	6
Decision making coordination among project participants	0.70	7
Social condition	0.69	8

**Findings**

This study recorded exceedingly high rate of responses, making large number of opinion available. Hence, it laid a reliable foundation for undoubtful outcome. The Quantity Surveyors and Civil/Structural Engineers in client, consulting and contracting organizations posses reasonably high years of experience, giving room for opportunity to be familiar with and be involved in the activities of the organization where they work. The number of Quantity Surveyors and Civil/Structural Engineers with advanced years of experience surpassed those having less years of experience. This signaled disparity in their level of

experience and familiarity with the activities in their place of work. The Quantity Surveyors and Civil/Structural Engineers were involved in civil engineering project at varying degree. Despite this, the average number of projects shown is considerably high. Therefore, it can be deduced that the Quantity Surveyors and Civil/Structural Engineers had acquired sufficient experience to establish their familiarity with civil engineering project cost estimate factors as well as those that had the tendency to influence its effectiveness.

Quantity Surveyors and Civil/Structural Engineers expressing their views from client's, consultant's and contractor's perspectives agreed that construction site condition, size of construction project, and construction project location were greatly important factors for civil engineering project cost estimate. However, these professionals (Quantity Surveyors and Civil/Structural Engineers) expressed different views in respect of the importance of construction project type. Consultant opined that this factor was very important while client and contractor perceived that it was moderately important. Hence, consultant placed higher premium on this factor than client and contractor as far as civil engineering cost estimate factors is concerned. Similarly, client and contractor attached higher degree of importance to construction material cost than consultant. This factor was considered to be moderately important by client and contractor while consultant viewed it to be highly important. Therefore, client and contractor rated this factor higher than consultant.

The importance of similar construction project was differently perceived by Quantity Surveyors and Civil/Structural Engineers. Consultant and contractor agreed that this factor was moderately important while client opined that it was highly important. Thus, reference to the cost of previous similar construction project was more important to consultant and contractor than the client while estimating the cost of civil engineering project. In addition, insurance requirement was placed on a higher pedestal by consultant than client and contractor in respect of cost estimate factors for civil engineering project. This factor was rated to be moderately important by client while it was considered to be highly important by consultant and contractor. This means consideration for insurance requirement of civil engineering project was more important to estimating the cost of civil engineering project as far as consultant is concerned. Inflation factor, on the other hand, commanded different degree of importance among client, consultant and contractor. This factor was rated higher by consultant compared to client's and contractor's rating. This indicated that consideration of inflation factor was paramount important to consultant than client and contractor as civil engineering project cost estimate factor. Moreover, contingency was perceived to be more important by consultant than client and contractor relative to civil engineering project cost estimate factor. This means that consultant believed that provision for unforeseen circumstances and incidental work was essential to estimating the cost of civil engineering project. In case of project schedule, it was perceived to be more important to consultant and contractor than the client. This factor was opined to play significant role in determining the cost estimate of civil engineering project by consultant and contractor. It can be deduced that the time allocated to the various activities and milestone for a project is more important to consultant and contractor than the client. Consequently, engineering review, labor wage rate, reputation of engineer and regulatory requirement commanded same degree of importance among client, consultant and contractor. These factors were placed on the same platform and believed to be a highly important civil engineering project cost estimate factors.

However, client, consultant and contractor unanimously ranked climatic condition highest among the listed factors believed to enhance the effectiveness of civil engineering project cost estimate. This opinion suggested that ability of civil engineering project cost estimate to meet the set target depends mostly on the climatic condition of the area where the project is

located. Apart from this, effectiveness of civil engineering project cost estimate moderately depends on coordinating ability and leadership skill of the project manager, competence of the project manager, monitoring and feedback by participants as well as economic condition and top management support. Also, consensus perception of client, consultant and contractor indicated that decision making coordination among project participants and social condition were highly important to achieving effective estimated cost of civil engineering project.

### **Conclusion**

Having discussed the results in this study, it is important to draw the following conclusions.

1. There is both consensus and different opinions among client, consultant and contractor in respect of the importance attached to civil engineering project cost estimate factors. Hence, the sides to which Quantity Surveyors and Civil/Structural Engineers belong do not always bring about agreement or disagreement in their opinion. Therefore, Client's, consultant's and contractor's perception on the importance of civil engineering project cost estimate factors is convergent and divergent. In this case, Client's, consultant's and contractor's perception is convergent on construction site condition, size of construction project, location of construction project, engineering review, labor wage rate, reputation of engineer and regulatory requirement. However, they expressed divergent views on construction project type, construction material, similar construction project, insurance requirement, inflation factor, contingency and project schedule.

2. Consensus opinion of client, consultant and contractor about factors enhancing the effectiveness of civil engineering project cost estimate contribute at three levels, comprising highly, moderately and very important. Hence, achieving effective cost estimate of civil engineering project mostly depends on the climatic condition of the project location. In this case, measures to mitigate the effect of climatic condition are mandatory. Effectiveness of civil engineering project cost estimate moderately depends on project manager's coordination and leadership skills, project manager's competence, monitoring and feedback by participants, economic condition and top management support. In view of this, steps that are capable of enhancing these factors are absolutely necessary. Also, effectiveness of civil engineering project cost estimate highly depends on decision making coordination among project participants and social condition. Hence, proper monitoring of these factors is highly essential.

### **Recommendation**

Based on the conclusions stated above, it is pertinent to recommend as follows.

1. The order of construction site condition, size of construction project, location of construction project, engineering review, labor wage rate, reputation of engineer regulatory requirement, construction project type, construction material, similar construction project, insurance requirement, inflation factor, contingency and project schedule should be followed by Quantity Surveyors and Civil/Structural Engineers in client, consulting and contracting organisations while estimating the cost of civil engineering project.

2. In order to ensure effectiveness of civil engineering project cost estimate, measures that is capable of cushioning the effect of climatic condition of the project location should be put in place. Project manager's coordination and leadership skills, project manager's competence, monitoring and feedback by participants, economic condition, and top management support should be enhanced. Also, decision making coordination among project participants and social condition should be closely monitored.

## References

- Adedokun, O. A.; Akinmusire, A. O. and Aje, I. O. (2016). *Effect of Contractor's Selection Criteria on cost performance of civil engineering projects. Conference proceedings on 21st Century Human Habitat: Issues, Sustainability and Development, 21 – 24 March, 2016, Federal University of Technology, Akure (FUTA), Nigeria* pp 616 – 625.
- Adnan, E, Sherif M, Saleh A (2009) - Factors affecting the performance of construction projects in the Gaza strip. *Journal of civil engineering and management, 15(3)*.
- Akinmusire, A. O (2015). Effects of contractors' prequalification criteria on the performance of civil engineering projects in Ondo and Lagos states, Nigeria. *An M.Tech. thesis, Quantity Surveying, School of Post Graduate Studies, Federal University of Technology, Akure.*
- Akinmusire, A. O and Ariyo, E. I (2009). Essentials of Teaching Measurement course by Quantity Surveyors in Higher Institutions. *Journal of advanced technology 1(3): 25 – 34.*
- Akinmusire, A. O and Ologunagba, M. M (2016). Consultants' perception of major construction project performance measurement criteria in Nigeria. *International Journal of Innovative Science, Engineering & Technology, 3 (4): 499 - 511.*
- Barbara, J. J. (2004). *Construction management jump start*. London: San Francisco: 2 – 140.
- Bubshait, A. A and Almohawis, S.A (1994) Evaluating the general condition of a construction contract. *International journal of project management 12(3); 133 – 135.*
- Chan, S.L and Park M. (2005). Project cost estimation using principal component regression, construction, management and economic vol.23 (3); pp 295 – 304.
- Eshofonie, F. P (2008) - Factors affecting cost of construction in Nigeria. *Msc. Thesis, Department of Building, University of Lagos. Nigeria.*
- Houghton, M, (2004). *The American Heritage dictionary of the English language.*
- Le, N.D. (2011). Risks affecting construction cost in Vietnam, available at <http://professionalprojectmanagement.blogspot.com.ng/2011/03/risks-affecting-construction-cost-in.html>, retrieved 13th October, 2015.
- Masamintu, O., Khairuddin, A.R., Toshihiko, O. and Kiyoshi, K. (2003, August 18 - 19). A comparative study on the standard forms of contract in Malaysia and Japan with specific reference to variation procedures. A paper presentation at the 2003 Quantity Surveyors National Conference at Sheraton Hotels and Tours, SubangJaya, Selengor, Malaysia.
- Navon, R (2005) - Automated project performance control of construction projects. *Automation in Construction.*
- Odunsanmi, T.K. and Onukwube (2013), comparative study of time and cost performance of direct labor and labor only procurement systems. *The Quantity Surveyor 44(3).*
- Oforeh, E.C (2006). The cost management of Heavy Capital Projects. Vol.1; *construction and management. First Edition. Cosines Nig. Limited.* 2006:1 – 10.
- Oyegoke, A.S (2003). Managing clients' expectation in project delivery. *The Quantity Surveyor 55(1):18 - 23*
- Rathsayam. T. (2009). Factors affecting project delivery time delays and cost overruns of project development at the Royal irrigation department of Thailand. *Professional project management education.*
- Takim, R and Akintoye, A (2002) - Performance indicators for successful construction



project performance. In: greenwood, d (ed.). *18th annual arcom conference, 2-4 September 2002, university of Northumbria. Association of researchers in construction management, 2.*