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Analysis of Factors Responsible for Project Cost Variation in Enugu, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Author EEE initiated the idea, designed, carried out data acquisition and compiled the first draft of the manuscript. Author CCE, supervise every stage of the work and proof read the original manuscript. Author FOE managed the literature searches while author CIO handles the data collection and analysis. All authors read and approved the final manuscript.

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ABSTRACT

Aim: The aim of this study is to analyze the factors responsible for the cost variation in the construction projects in Enugu, Nigeria, with a view to establishing the impacts of this factors on project delivery in the study area.
Study Design: it was a survey research, the study was effected via literature review and a well-structured questionnaire. Likewise, interviews were carried out to substantiate the findings of the questionnaire survey.
Place and Duration of the Study: The study was conducted in Enugu state, Nigeria for a period of 2 years.
Methodology: Being a survey research, a total of one hundred and twenty-six (126) questionnaires were distributed with one hundred and three (103) returned and adequately filled given a percentage response of 81.7%. The data collected was presented and analyzed using tables, frequency, mean score and relative importance index. The analysis was aided by a computer-based software, named Statistical Package of Social Sciences (SPSS) version 22.

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Results: The study found out that more than 40% of the respondents have experience cost overrun while more than 60% of the respondent attest that cost overrun occurs always most of their project. The study observed that the principal factors responsible for this overrun in construction projects in the study area are: poor contract management deficiency in prepared cost estimate and incomplete design. Furthermore, the study observed that the contractor's desire to improve his financial condition, poor site management and Defective workmanship and availability of skilled labor and change orders/ variation are least factors that contribute to cost overrun in projects in the study area. The study established that the most common effect of cost overrun on project delivery are loss of profit (1.09), fewer returns on investment (0.86) while the least effect is higher rental/lease cost or price (0.70).
Conclusion: The study concluded by recommending that proper contract management, value engineering and effective communication should maintain throughout the lifecycle of the project.

Keywords: Project variation; cost overrun; construction; construction industry; Enugu.

1. INTRODUCTION

Cost is a major problem in construction industry around the world. The inability to complete projects on time and within budget continues to be a chronic problem worldwide and is worsening [1]. The study [2] of variation on construction projects found out that the average cost escalation was 7% of the original project cost with an average time extension of 30% more than the original project duration. Ameh et al. [3] conducted questionnaire survey on cost study in United Kingdom and found out that 63% of 1778 construction projects financed by World Bank faced poor performance with overrun in budget at an average of 40%. In Ghana, 75% of projects exceeded the original project cost whereas only 25% were completed within budget [4]. Cost overrun in construction projects can occur due to many reasons. Smprasent [5] pointed out that cost overrun is caused by ineffective construction management and poorly established cost control system. Odeyinka and Yusuf [6] have observed that seven out of ten projects surveyed in south-east Nigeria suffered delays in their execution due to the problem of cost overrun.

Furthermore, cost variation is a very frequent phenomenon and is inevitable in most construction project globally. Maintaining steady cost projection on construction projects has being an issue of serious concern, both to the client and project contractors. According Aziz [7] construction has been considered as dynamic industry which is constantly facing uncertainties in its budgets, processes and technology. These uncertainties increase the complexity of projects which invariably make the management of cost difficult in a construction project. However, there have been improvement in the management of construction projects, the problem of cost and time overruns persist in most construction project. Based on this, [8] argued that the problem of cost variation is critical and needs to be studied more to alleviate it in future. Also, [8] pointed that cost variation is the major problem in both developing and developed countries. In most countries, experience and literature revealed that construction projects on/before completion could increase from 10–50% of the total project's cost [9]. Therefore, to identify the causes of cost variation is of critical importance to the profitability of most construction projects.

Cost variation is a deviation from the budgeted or planned cost of a construction project. Cost variation for most construction projects are caused by many factors which is usually linked to the performance of time, cost, and quality. The project managers often fail to recognize how important it is to develop, refine and follow plans to meet project goals in line with these performance parameters. Conversely, each year both developed and developing economies declare and implement capital projects to generate goods and services that have both domestic and international demands, in order to boost their economy and provide economic opportunities and social welfare to their citizens. However, it has been discovered that both public and private sector projects are vulnerable to failure because of myriad of problems. Even if the resources are available, projects can fail due to lack of information or level of awareness of achieving a better approach to quality of product at a reduced cost. Also, during project execution and implementation, most construction projects tend to suffer due to communication gap between the construction team and other stake holders. Realistic stakeholder expectation can be spotted through effective communication routines, insufficient communication and lack of

stakeholder integration are among the most common drivers for unattended change causes and uncontrolled change impact in a project [10]. Therefore, the effective communication routines between stakeholders requires considerable attention and effort during the project development and planning phase in order to prevent development dysfunction culture [11].

In south-east particularly in Enugu the demand for construction project has been increase. This have trigger lot of construction project both owned by public and private. Due to issues bordering on cost overrun, most development projects have suffered failure and abandonment and hence formed a clog on the wheel of progress which little or nothing has been done to curtail the phenomenon. On this note, the study set is to analyze the factors responsible for cost variation in construction projects in Enugu, Nigeria, with a view to establishing their impacts on project delivery and establishing strategies towards their mitigation in the study area.

2. LITERATURE REVIEW

2.1 Cost Variation and Nigerian Building Industry

The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgments. Many projects experience extensive delays, exceed initial time schedule and cost estimate to the dislike of clients, contractors and consultants. This problem is more evident in the traditional and public sector type of projects in which contract is awarded to the lowest bidder. This is the contract awarding strategy of the majority of public projects in developing countries including Nigeria. Construction projects in the south eastern Nigeria have suffered serious neglects and setbacks since the Nigeria civil war. In an attempt to address some of the perceived ills in the construction industry marked a milestone in the development of the region. To say the least, the construction industry in south east Nigeria has continued to undergo through complex changes in the recent times such that clients, contractor's and consultants now seek to adopt several survival strategies in the face of Keen competition in order to complete projects at the required time and cost. Factors influencing cost overrun are numerous and therefore require in-depth analysis in order to determine the management of influence and their significant rankings. Previous researchers have attempted to discover reasons for the disparity between the tender sum and the final amount. This study identifies the factors that influence project cost overrun. Four factors were identified from the existing research findings of Kaming et al. [12] and Chimwaso [13]. These are; "design changes", "inadequate planning", "unpredictable weather conditions", and "Fluctuations in the cost of building materials". To broaden the investigation, it was decided to complement the above list of factors with other factors gleaned from the final account reports. These were compared with the factors from the existing research findings, and final lists of 18 factors were prepared. They were then divided into two groups of seven critical factors and nine other factors, which are usually ignored, but perceived to be of equal significance [13]. Similarly, project time overruns adversely influence the performance of construction projects in the South Eastern Zone of Nigeria [12] define time overrun as the extension of time beyond planned completion date traceable to the contractor.

Delays are incidents that impact a project's progress and postpone project activities. Delay causing incidents may include weather delays, unavailability of resources, design delays, etc. In general, project delays occur as a result of project activities that have both external and internal cause and effect relationship, [14]. In their own contributions [15,16] define time overrun as the difference between the actual completion time and the estimated completion time. It was measured in number of days. Project delays cause the project completion date to be increased [17]. From above time overruns is defined as the time increased to complete the project after planned date which is caused by internal and external factors surrounding the project. In some cases, time overrun problems usually result to project cost overrun [18] refer to cost overrun as excess of actual cost over budget. Cost overrun is also sometimes called "cost increases", or "budget overrun". It is the change in contract amount divided by the original contract award amount. This calculation was converted to a percentage for ease of comparison by Jackson [19].

> Cost overrun = final contract amount – original contract amount

Construction Project in south eastern Nigeria have suffered from serious time and cost overruns which have led to so many project

abandonment and failure. It has resulted to multiplier effect on the economy of the country leading to colossal loss of scarce resources and poor infrastructural development. A typical example are flyover projects at Owerri, Onitsha-Enugu, and Enugu-Port Harcourt express ways which have been abandoned due to time and cost overruns. These problems could be attributed to certain factors which need to be identified and examined critically. For instance, significant considering the climatic condition, weather and environmental characteristics usually challenge project success. For that reason, it is of key important to detect the salient factors, treat all weakness points and from all sides give specific priorities in order to avoid time and cost overruns in construction projects.

3. METHODOLOGY

This study was carried out in Enugu State, Nigeria, using a survey method. The population of this study constitutes of fully registered professionals particularly Architects, Builders, Structural Engineers and Quantity Surveyor, residing and practicing in the study area. The population of these professionals as obtained from the various secretariats in the state is 126. Due to the smallness of the population frame of the study, the entire population was adopted as the sample size for the study. Data were collected through structured questionnaire administered to the selected respondents or their representatives. Accordingly, a total of 126 questionnaires and only 103 questionnaires were completed, returned and found useful. This corresponds to response rate of 81.75% while the percentage of number of questionnaires not returned stood at 18.25% (see Table 1)

Being a descriptive research, tables, line –chart, mean and histogram were used for data presentation. However, Relative Important Index (RII) was used for ranking and computed using:

$$RII = \sum Fx / A*N$$

Where:

∑Fx =Weight given to each statement by respondents and ranges 1 – 5
A = Higher Response Integer
N = Total Number of Respondents

4. RESULTS AND DISCUSSION

Fig. 1 examined the level of involvement of the respondents to project that involved cost overrun.

Table 1. Distribution of questionnaire and percentage response

Questionnaires	Frequency	Percentage (%)
Number of questionnaires returned	103	81.75
Number of questionnaires not returned	23	18.25
Total	84	100

Source: Field survey (2018)

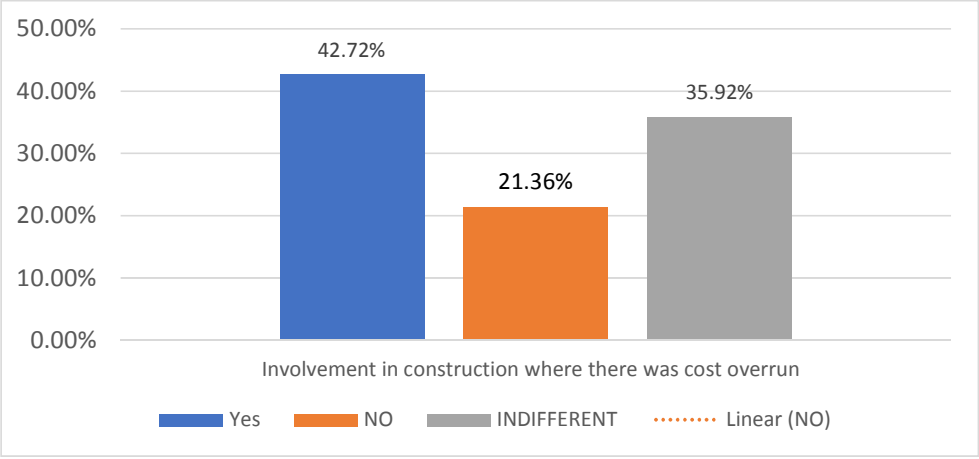

Fig. 1. Involvement in construction where there was cost overrun
Source: Field survey (2018)

The result in Fig. 1, indicates that 42.72%, 35.92% and 21.36% of the respondents have witness cost overrun in their project, indifferent and have not involved in a project that involved cost overrun respectively. The ratio of yes to no stood over 40% to 20%. Hence, it would be deduced that greater percentages of the respondents in the study area have been involved in project that involved cost overrun.

In Fig. 2 the study intends to examine the frequency of occurrence of cost overrun in projects.

Fig. 2, examined the frequency of occurrence of cost overrun in projects in the study area. The findings in Fig. 2, depicts that 45.51%, 21.36% and 33.13% of the respondents agree that cost overrun always, often and occasionally occurs in their projects respectively. Also, the results in Fig 2 indicates that 0% of respondents were indifferent and never respectively. The ratio of those in Always and often to other is 66.87 to 33.13%. This finding supports the results in Fig. 1. Hence, cost overrun does occur in construction projects in the study area and it's a regular phenomenon.

Table 2, examined the factors the factors responsible for cost overrun in projects in the study. The result of the analysis is presented as detailed in Table 2.

The results in Table 2, indicates that the factors they are mostly responsible for cost overrun in projects within the study area are: Poor Contract Management (1.02), Deficiency in prepared Cost Estimate and Incomplete design at the time of tender Orders (0.99) Problems in finance and payment agreements (0.94), Frequent Design Changes (0.93), Difficulty in obtaining construction Material/ Inflation (0.91) and Unexpected Sub-soil Condition (0.90). On the other hand, the results in Table 2, indicate that the factors that rarely contributes to cost overrun in the projects in the study area are: Contractor's desire to improve his financial condition (0.71), Poor site management and Defective workmanship (0.74) and Availability of Skilled Labor and Change orders/ variation (0.80)

In Table 3, the effects of the cost overrun on projects were examined as presented as follow:

The results in Table 3, shows that the impacts of cost overrun in projects in the study area according to their severity are: Loss of profit (1.09), Fewer returns on investment (0.86) and Tarnish professional reputation (0.86) while the least effects are: Higher rental/lease cost or price (0.66), Increase in project cost (0.70) and Affect the rate of national growth (0.74). Thus, the results in Table 3 indicates that rather the cost overrun affecting the contractual cost, it affects the profits margin of the contractor most. Based on this, the researchers interview some building contractors in the study area. The outcome of the interview indicates that contractor profit margin is mostly affects when cost overrun occurs in project. Because, they may be trying to safeguard their professional reputation.

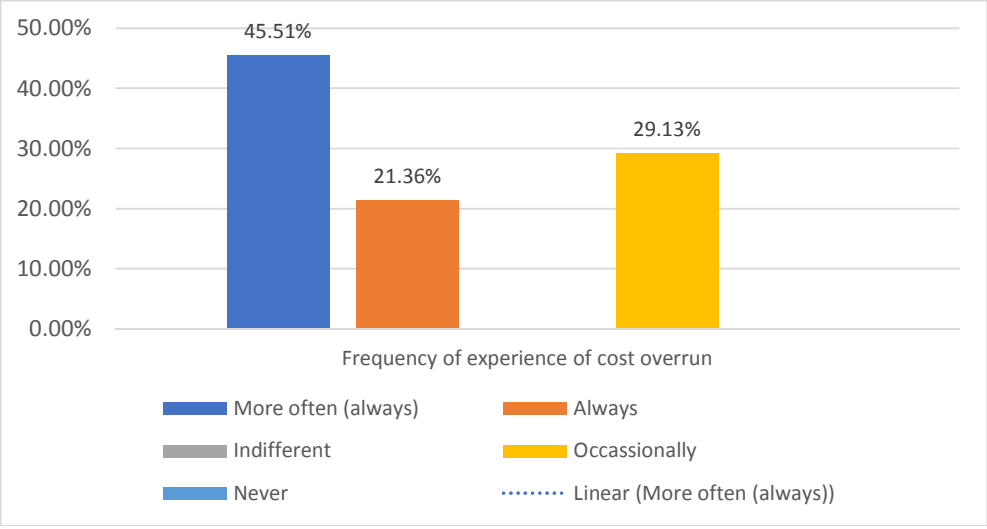

Fig. 2. Frequency of experience of cost overrun
Source: Field survey (2018)

Table 2. Factors responsible for cost overrun in projects in the study area

S/N	Factors	Frequency							Mean	RII	Rank
		1	2	3	4	5	(∑f)	∑fx			
1	Difficulty in obtaining construction material/ inflation	-	23	-	98	06	103	468	4.54	0.91	5th
2	Availability of skilled labor and change orders/ variation	-	17	62	48	-	103	412	4.00	0.8	11th
3	Unexpected sub-soil condition	-	23	04	94	06	103	464	4.50	0.90	6th
4	Problems in finance and payment agreements	-	17	05	88	17	103	486	4.72	0.94	3rd
5	Poor contract management	-	-	-	110	17	103	525	5.10	1.02	1st
6	Frequent design changes	-	05	27	88	07	103	478	4.64	0.93	4th
7	Poor site management and Defective workmanship	-	20	54	41	12	103	383	3.72	0.74	12th
8	Lack of contractor/ sub-contractor experience and additional work	-	16	38	73	-	103	438	4.25	0.85	10th
9	Fraudulent practices and kickbacks	12	15	-	100	-	103	442	4.29	0.86	8th
10	Deficiency in prepared cost estimate and incomplete design at the time of tender orders	-	-	-	127	-	103	508	4.93	0.99	2nd
11	Communication gap between client, consultant and contractor	-	23	08	96	-	103	454	4.41	0.88	7th
12	Contractor's desire to improve his financial condition	-	30	80	17	-	103	368	3.57	0.71	13th
13	Natural disaster	-	06	53	68	-	103	443	4.30	0.86	8th

Source: Field survey (2018)

1- Strongly disagree, 2-Disagree, 3- Undecided, 4- Agree, 5- Strongly agreed. RII: Relative importance index

Table 3. Effect of cost overrun in construction projects

S/N	Effect	Frequency							Mean	RII	Rank
		1	2	3	4	5	(∑f)	∑fx			
1	Increase in project cost	23	36	19	37	12	103	360	3.50	0.70	7th
2	Fewer returns on investment	-	30	15	70	12	103	445	4.32	0.86	2nd
3	Higher rental/lease cost or price	32	34	24	18	19	103	339	3.29	0.66	8th
4	Tarnish professional reputation.	13	17	41	51	05	103	399	3.87	0.77	3rd
5	Loss of profit	-	-	17	39	71	103	562	5.46	1.09	1st
6	Project abandonment	25	22	27	25	28	103	390	3.79	0.76	5th
7	Prevents planned increase in property and services production from taking place	-	32	29	40	16	103	391	3.80	0.75	4th
8	Affect the rate of national growth	09	41	34	27	16	103	381	3.70	0.74	6th

Source: Field survey (2018)

1- Strongly disagree, 2-Disagree, 3- Undecided, 4- Agree, 5- Strongly agreed. RII: Relative importance index

5. CONCLUSION

Based on the research objectives and findings, the following conclusions were drawn:

i. Cost overrun does occur in construction projects in the study area and it's a regular phenomenon;
ii. Poor Contract Management, Deficiency in prepared Cost Estimate and Incomplete design at the time of tender Orders' are predominantly the main causes of cost overrun in the area of study; and
iii. The impacts of cost overrun in projects in the study area according to their severity are: Loss of profit, Fewer returns on investment and destruction of professional reputation.

On the note, the study recommends the followings:

i. Proper planning of project activities is a major remedy to the construction cost overrun in connection with other strategies such as Use of good project management scheduling tools and charts.
ii. Constantly track and measure the progress'; 'Ensuring that there is no communication gap between the professionals, the contractors the client and the technicians and 'the selection of contractors not only be based on the lowest bid, but also on experience, financial capacity and expertise; are other strategies identified as a remedy to cost overrun.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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