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ANALYSIS OF FACTORS RESPONSIBLE FOR PROJECT COST VARIATION IN

ENUGU, NIGERIA

Original Research Article

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7 Abstract:

The aim of this study is to analyze the factors responsible for the cost variation in the 8 9 construction projects in Enugu, Nigeria, with a view to establishing the impacts of this factors on project delivery in the study area. This is a survey research via literature review and a well-10 11 structured questionnaire. Likewise, interviews were carried out to substantiate the findings of the questionnaire survey. The study was conducted in Enugu state, Nigeria for a period of 2 years. 12 Being a survey research, a total of one hundred and twenty-six (126) questionnaires were 13 distributed with one hundred and three (103) returned and adequately filled given a percentage 14 response of 81.7%. The data collected was presented and analyzed using tables, frequency, mean 15 score and relative importance index. The analysis was aided by a computer-based software, 16 named Statistical Package of Social Sciences (SPSS) version 22. The study found out that more 17 18 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 19 the principal factors responsible for this overrun in construction projects in the study area are: 20 21 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, 22 23 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 24 25 study established that the most common effect of cost overrun on project delivery are loss of profit (RII=1.09), fewer returns on investment (RII=0.86) while the least effect is higher 26 27 rental/lease cost or price (RII= 0.70). The study concluded by recommending that proper contract 28 management, value engineering and effective communication should maintain throughout the 29 lifecycle of the project.

30 Keywords: Project variation, Cost overrun, Construction, Construction Industry, Enugu.

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32 **1 INTRODUCTION**

33 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 34 worsening [1]. The study [2] of variation on construction projects found out that the average cost 35 36 escalation was 7% of the original project cost with an average time extension of 30% more than the original project duration. [3] conducted questionnaire survey on cost study in United 37 Kingdom and found out that 63% of 1778 construction projects financed by world bank faced 38 39 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 40 41 overrun in construction projects can occur due to many reasons. [5] pointed out that cost overrun is caused by ineffective construction management and poorly established cost control system. [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.

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Furthermore, cost variation is a very frequent phenomenon and is inevitable in most 46 construction project globally. Maintaining steady cost projection on construction projects has 47 being an issue of serious concern, both to the client and project contractors. According [7] 48 construction has been considered as dynamic industry which is constantly facing uncertainties in 49 its budgets, processes and technology. These uncertainties increase the complexity of projects 50 which invariably make the management of cost difficult in a construction project. However, 51 there have been improvement in the management of construction projects, the problem of cost 52 and time overruns persist in most construction project. Based on this, [8] argued that the problem 53 54 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 55 countries, experience and literature revealed that construction projects on/before completion 56 57 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. 58

Cost variation is a deviation from the budgeted or planned cost of a construction project. Cost 60 variation for most construction projects are caused by many factors which is usually linked to the 61 performance of time, cost, and quality. The project managers often fail to recognize how 62 important it is to develop, refine and follow plans to meet project goals in line with these 63 64 performance parameters. Conversely, each year both developed and developing economies declare and implement capital projects to generate goods and services that have both domestic 65 and international demands, in order to boost their economy and provide economic opportunities 66 and social welfare to their citizens. However, it has been discovered that both public and private 67 sector projects are vulnerable to failure because of myriad of problems. Even if the resources are 68 available, projects can fail due to lack of information or level of awareness of achieving a better 69 70 approach to quality of product at a reduced cost. Also, during project execution and 71 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 72 73 through effective communication routines, insufficient communication and lack of stakeholder 74 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 75 76 stakeholders requires considerable attention and effort during the project development and 77 planning phase in order to prevent development dysfunction culture [11].

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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
- 85 project delivery and establishing strategies towards their mitigation in the study area.
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87 2 LITERATURE REVIEW

88 2.1 Cost Variation & Nigerian Building Industry

The successful execution of construction projects and keeping them within estimated cost and 89 prescribed schedules depend on a methodology that requires sound engineering judgments. Many 90 projects experience extensive delays, exceed initial time schedule and cost estimate to the dislike 91 of clients, contractors and consultants. This problem is more evident in the traditional and public 92 sector type of projects in which contract is awarded to the lowest bidder. This is the contract 93 awarding strategy of the majority of public projects in developing countries including Nigeria. 94 Construction projects in the south eastern Nigeria have suffered serious neglects and setbacks 95 96 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 97 industry in south east Nigeria has continued to undergo through complex changes in the recent 98 99 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. 100

Factors influencing cost overrun are numerous and therefore require in-depth analysis in order 101 to determine the management of influence and their significant rankings. Previous researchers 102 have attempted to discover reasons for the disparity between the tender sum and the final 103 amount. This study identifies the factors that influence the cost overrun. Four factors were 104 identified from the existing research findings of [12;13]. These are; "design changes", 105 "inadequate planning", "unpredictable weather conditions", and "Fluctuations in the cost of 106 building materials". To broaden the investigation, it was decided to complement the above list of 107 factors with other factors gleaned from the final account reports. These were compared with the 108 factors from the existing research findings, and final lists of 18 factors were prepared. They were 109 then divided into two groups of seven critical factors and nine other factors, which are usually 110 ignored, but perceived to be of equal significance [13]. Similarly, project time overruns 111 adversely influence the performance of construction projects in the South Eastern Zone of 112 Nigeria [12] define time overrun as the extension of time beyond planned completion date 113 traceable to the contractor. 114

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Delays are incidents that impact a project's progress and postpone project activities. Delay 116 causing incidents may include weather delays, unavailability of resources, design delays, etc. In 117 118 general, project delays occur as a result of project activities that have both external and internal 119 cause and effect relationship, [14]. In their own contributions [15:16] define time overrun as the 120 difference between the actual completion time and the estimated completion time. It was 121 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 122 planned date which is caused by internal and external factors surrounding the project. In some 123 cases, time overrun problems usually result to project cost overrun [18] refer to cost overrun as 124 excess of actual cost over budget. Cost overrun is also sometimes called "cost increases", or 125

126 "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 [19].

128 Cost overrun = final contract amount – original contract amount

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130 Construction Project in south eastern Nigeria have suffered from serious time and cost 131 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 132 infrastructural development. A typical example are flyover projects at Owerri, Onitsha-Enugu, 133 and Enugu-Port Harcourt express ways which have been abandoned due to time and cost 134 overruns. These problems could be attributed to certain factors which need to be identified and 135 examined critically. For instance, significant considering the climatic condition, weather and 136 environmental characteristics, usually challenge project success. For that reason, it is of key 137 138 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. 139

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141 **3 METHODOLOGY**

This study was carried out in Enugu State, Nigeria, using a survey method. The population of 142 this study constitutes of fully registered professionals particularly Architects, Builders, Structural 143 Engineers and Quantity Surveyor, residing and practicing in the study area. The population of 144 these professionals as obtained from the various secretariats in the state is 126. Due to the 145 smallness of the population frame of the study, the entire population was adopted as the sample 146 size for the study. Data were collected through structured questionnaire administered to the 147 selected respondents or their representatives. Accordingly, a total of 126 questionnaires and only 148 103 questionnaires were completed, returned and found useful. This corresponds to response rate 149 of 81.75% while the percentage of number of questionnaires not returned stood at 18.25% 150

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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
	84	100

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Source: Field Survey (2018)

- RII =∑Fx /A*N
- 158 Where:
- 159 $\sum Fx =$ Weight given to each statement by respondents and ranges 1-5
- 160 A = Higher Response Integer
- 161 N = Total Number of Respondents
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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:



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

Fig 1 indicates that 42.72, 35.92 and 21.36% of the respondents have witness cost overrun in 168 in their project, indifferent and have not involved in a project that involved cost overrun. The 169 ratio of yes to no stood over 40 to 20%. Hence, it would be deduced that greater percentages of 170 171 the respondents in the study area have been involved in project that involved cost overrun.



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FIG 2 Frequency of experience of cost overrun Source: Field Survey (2018)

Fig 2 shows the frequency of occurrence of cost overrun in projects in the study area. Fig 2, 175 shows that 45.51, 21.36 and 33.13% of the respondents agree that cost overrun always, often and 176 occasionally occurs in their projects respectively. Also, Fig 2 indicates that none of the 177 178 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 179 180 occur in construction projects in the study area and it's a regular phenomenon.

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TABLE 2 Factors responsible for cost overrun in projects in the study area Source: Field Survey (2018)

Rank

5th

 11^{th}

 6^{th}

3rd

 1^{st} 4^{th}

 12^{th}

 10^{th}

 8^{th}

 2^{nd}

 7^{th}

13th

 8^{th}

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

1- Strongly Disagree, 2-Disagree, 3- Undecided, 4- Agree, 5- Strongly Agreed. RII: Relative Importance Index

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Table 2 indicates that the factors the are mostly responsible for cost overrun in projects within 185 186 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 187 188 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, TABLE 189 190 2 indicates 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 191 Defective workmanship (0.74) and Availability of Skilled Labor and Change orders/ variation 192 (0.80)193

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2	0	0

TABLE 3 Effect of Cost Overrun in Construction Projects

S/N	Effect	FR	EQU	JENC	CY	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	7^{th}
2	Fewer returns on investment	-	30	15	70	12	103	445	4.32	0.86	2^{nd}
3	Higher rental/lease cost or price	32	34	24	18	19	103	339	3.29	0.66	8^{th}
4	Tarnish professional reputation.	13	17	41	51	05	103	399	3.87	0.77	3^{rd}
5	Loss of profit	-	-	17	39	71	103	562	5.46	1.09	1^{st}
6	Project abandonment	25	22	27	25	28	103	390	3.79	0.76	5^{th}
7	Prevents planned increase in property	-	32	29	40	16	103	391	3.80	0.75	4^{th}
	and services production from taking										
	place										
8	Affect the rate of national growth	09	41	34	27	16	103	381	3.70	0.74	6^{th}
1- Stro	ngly Disagree, 2-Disagree, 3- Undecided, 4-	- Agre	e, 5-	Stroi	ngly A	Agree	d. RII:	Relati	ve Importa	nce Inc	lex

Source: Field Survey (2018)

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Table 3 shows that the impacts of cost overrun in projects in the study area according to their 202 severity are: Loss of profit (1.09), Fewer returns on investment (0.86) and Tarnish professional 203 reputation (0.86) while the least effects are: Higher rental/lease cost or price (0.66), Increase in 204 project cost (0.70) and Affect the rate of national growth (0.74). Thus, the results in table 3 205 indicates that rather the cost overrun affecting the contractual cost, it affects the profits margin of 206 207 the contractor most. Based on this, the researchers interview some building contractors in the 208 study area. The outcome of the interview indicates that contractor profit margin is mostly affects when cost overrun occurs in project. Because, they maybe trying to safeguard their professional 209 210 reputation.

211 5 CONCLUSIONS AND RECOMMENDATIONS

- 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 regularphenomenon.
- 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.

- 218 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.
- 220 On the note, the study recommends the following:
- 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.

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