



## **APPRAISAL OF PROJECT DELAY MANAGEMENT IN CONSTRUCTION INDUSTRY IN EBONYI STATE, NIGERIA**

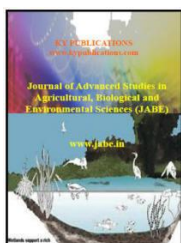
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### **ABSTRACT**



This paper evaluates the effect of delays on building project execution. The aim is to examine critically the causes and impact of construction delays on project delivery in Ebonyi state, Nigeria. Data gathering technique and responses involve the use of structured questionnaires and oral interview directed at both contractors and consultants. The result reveals that an organized and controlled project would reduce labour cost, cost associated with management of resources and quantity of project and thereby minimize delays. The research thereby concludes by stating that greater efforts should be given to mode of financing and payment for completed work which is a very significant factor responsible for delay(s) in construction project (88.67) caused by the client using severity index formula, poor site management (85.33), underestimation of time for project (83.33), improper planning (80) caused by the contractor, and disputes on reveals as the most important factor causing delays. It went further to say that delay(s) when occurred in a project, it normally leads to general increase in the cost of construction and finally that the application of schedule crashing (78) and change in logic techniques (74.67) proves to be effective in delay recovery. Suggested recommendation, include that client should make adequate provision for project fund and honor interim certificates as and when due to ensure regular progress of work. Consultants should ensure that all the necessary information and scope of work are formed before the award of the contracts to reduce change order.

Keywords: Delay, Project, Construction, Contractor, Cause, Cost

### **INTRODUCTION**

Delay could be defined as the time over run either beyond completion date specified in a contract or beyond the date that the parties agreed upon for delivery of a project. It is a project slipping over its planned schedule and is considered as a common problem in construction projects. According to Assaf and Al-Hejji (2006).

Bassioni and El-Razek (2008) identified that delay in construction project is considered one of the most common problems causing multitude of negative effect on the project and its participating parties. Therefore, it is essential to identify the actual causes of delay in order to minimize and avoid the delays and their corresponding expenses. Arditi and Pettanakitchamroon (2006), stated that delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increased costs, and contract termination. The party experiencing damages and the parties responsible for them in order to recover time and cost. Oseghale and Ohigbenga (2008), stated the effect on the completion of a project when delay occurs which includes, variation in quantities of materials, fluctuation price of materials, substantial increase in project cost, abandonment of the project, frustration and disillusionment are things that contributed to project delay management.



However, in general delay situations are complex in nature. A delay in an activity may not result in the same amount of project delay. A delay caused by a party may or not affect the project completion date and may or may not cause damage to another party. A delay might occur concurrently with other delays and all of them may impact in the project completion date. Delays caused by the client such as late submission of drawings and specification, frequent change orders, and inadequate site information generate claims from both the main contractors and subcontractors which many atimes entails lengthy court battles with huge financial repercussions. Delays caused by contractors can generally be attributes to poor managerial skills, lack of planning and a poor understanding of accounting and financial principle have led to many contractor's downfall.

**Problem statement / justification**

Project delays have been one of the most prevailing problems in construction projects in Ebonyi state. This delays has it impact on project delivery which findings shows that cost overrun, time over run and project abandonment are the effect experienced by delay in construction industry in Ebonyi state. Improper planning, poor contract management, slow decision making, design errors and cash problems were the major causes of delay in most of the project.

**Objective(s) of the study**

The major purpose or aim of this study work is to examine critically the causes and impact of construction delays on project delivery in Ebonyi state. This research would make attempt to resent suggestive solutions to the problems of delays faced by construction industries, so as to ensure effective execution of future projects with these problems and also meet the pre-determined contractual date of completion. The research questions include the following:

1. Identify and evaluate the effect of delays on building project execution.
2. Assess the effect of delay on the completion time of building project.
3. Bring to the knowledge of parties the actual causes of project delay delivery.
4. Identify and describe current good practice in managing, handling and settling the significant, of delays.
5. Examine the significant of delay on the cost of construction project.
6. Propose solutions to project delays by ranking their impacts and investigating how they could be eliminated or minimized.

**Conceptual Framework**

In the study of Alaghbari et al. (2007), delay is generally acknowledged as the most common, costly, complex and risk problem encountered in construction projects. Because of the high importance of time for both the owner (in terms of performance) and the contractor (in terms of money), it is the source of continuous disputes and claims leading to lawsuits. Delays caused by the client such as late submission of drawings and specifications, continuous change orders, and incorrect site information generates claims from both the main contractors and sub-contractors which many times entail lengthy court battles with huge financial problems. Delays caused by contractors can generally be concluded to poor managerial skills, lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall. Under some circumstances, a contractor may be entitled to claim delay damages if he finishes later than an owner-accepted early completion schedule but is skill ahead of the official contract completion date. This may occur if the contractor establishes a direct cause-and-effect relationship between owner's breach of a contractual obligation and the delay. In addition, the contractor has the burden of establishing its increased costs as a result of the delay.



Majid (2006), stated that delays can be minimized when their causes are identified. Identification of the factors that contributed to the causes of delays has been studied by numerous researchers in several countries. Delay is a situation when the contactor, consultant, and client jointly or severally contributed to the non-completion of the project within the original or the stipulated or agreed contract period.



Effect of delay in construction projects

#### Review of Related Literature

The literature review examined works by different authors in project delay, which indicate the main categories of delays in construction, includes engineering, equipment, external delays, labour, management, material, owner, sub-contractors and weather. According to Yates (2003). The causes of delay and cost overrun in construction project in Nigeria. The results showed that the most important factors are financing and payment for completed works, poor contract management, changes in site conditions and in proper planning by Mansfield et al, (1994).

Similarly, Mohammed & Isah (2012), conducted a review on project delays in developing countries during planning and construction stages. In their study, they found that the delay and cost overruns of construction projects are dependent on the very early stage of the project.

According to Alaghabari et al. (2007). Delays caused by the client such as late submission of drawings and specifications, continuous change orders, and incorrect site information generates claims from both the main contractors and sub-contractors which many times entail lengthy court battles with huge financial problems. Delays caused by contractors can generally be concluded to poor managerial skills, lack of planning and a poor understanding of accounting and financial principles have led to many a contractor's downfall.

The review as stated by Divekar K. and Subramanian K. (2009), presented a paper on method for computing activity delays and assessing their contributions to project delay. The method consisted of a set of equations, which could be easily coded into a computer program that would allow speedy access to project delay in information and contributions.

The circumstances surrounding most developing countries, Nigeria inclusive is more pathetic in view of the advancement in technology due to the globally changes in construction industries, poor and re-work, location of project site, non following of due process in construction and accessibility of material and labour. According to Alaghabari et al (2009), delay is generally acknowledged as the most common, costly, complex and risk problem encountered in project delay in construction projects were extensively discussed.



Some gap existed, Basu (2005) carried out a study on factors at the start of a project that almost certainly lead to project delays and provided insight into the reasons for the delay and their impact on schedule.

Toor and Ogunlana (2008) carried out a study of construction delays in Thailand. They found that the problems faced by the construction industry in developing economics like Thailand could be: (a) Storages or inadequacies in industry infrastructure (mainly supply of resources); (b) caused by clients and consultants and (c) caused contractor's in competence/ inadequacies. They recommended that there should be concerted effort by economy managers and construction industry associations to provided the necessary infrastructure for efficient project management.

Asaaf et al (2006) and Chan and Kumaraswamy (2002), carried out a research on decision during development stage or changes in working drawings as the most important factor considered by the professionals in Nigeria construction industry.

Drawing approval as well as delayed payments or financial processes difficulties also emerged in this study as important factors that causes project delivery delays in Nigeria. This is similar to the outcome of researches carried out by Frimpong et al (2003) and Toufic and Wissam (1998).

### **Methodology**

#### **Population and study Area**

The survey research methodology has been adopted for this research. The target population consists of construction industries both building and engineering projects in Ebonyi state, Nigeria.

#### **Sampling Technique**

This survey was designed to sample the opinion of building and engineering contractors consisting of architects, quantity surveyors, builders, civil/ structural engineers, electrical and mechanical engineers engaged in consultancy, constructing and government agencies. The sampling technique adopted for this study is the stratified sampling techniques. This is because the nature of the population, the construction industry in both government and private sectors.

Them in this industry we have building, civil engineering and heavy engineering construction which defer. The professionals involved are not of the same profession. Even in the profession they have different academic qualification.

This makes the stratified sampling method to be suitable so as to classify these different stages in order to get a sample.

#### **Methods of data collection**

The researcher also used the primary and secondary methods of data collection. The primary data is based on past construction project bills of quantities, drawings and questionnaire. The questionnaire was chosen to be the best of collecting data in this research since the questionnaire is probably them outwardly used data collection technique for conducting surveys. Questionnaire have been widely used for descriptive and analytical surveys in order to find out the facts, opinions and views (Naoum, 1998). The questionnaire is mailed to respondent who are expected to read and understand the questions and write down the reply in the space meant for the purpose in the questionnaire itself. It enhances confidentiality, supports internal and external validity, facilitates analysis, and saves resources. Data's are collected in a standardized form. The standardized form allows the searcher to carryout statistical inferences on the data, often with the help of computers. A questionnaire survey was designed based on the objectives of the study, which are causes of construction delays and effects of construction. A questionnaire survey was developed to get the opinion and understanding from the experienced respondents regarding to the construction or project delays problem. The data obtained from the questionnaire was analyzed and results for the major impacts



were identified. Stratified technique was used to validate the obtained data from the questionnaire. While the secondary data were based on published textbooks and lecture notes.

#### Data analysis techniques

The statistical tools were used in the analysis of data collected and to know the factors which are most responsible for delays in construction project. The researcher used the "severity index" which is a statistical method used for analysis in order to rank the factors most responsible for delays in construction industry. These results are arriving summarized and shown better in a retrogressive pattern. The factors are very significant, significant, slightly, significant partially, not significant to delays in construction projects.

#### Data collection and analysis from forty construction sites

##### Presentation of data

During the data collection, it was observed that most professionals received and filled the questionnaires and also provided hints and facts to the questionnaires. A total of 40 questionnaires were distributed to the different professionals. The data collected were presented as shown below

**Table 1: RESPONSES TO QUESTIONS**

STATUS OF RESPONDENT	NO. OF QUESTIONNAIRES ADMINISTER	RESPONSES	PERCENTAGE
Director	5	5	12.5
Supervisor	8	8	20
Project Manager	17	17	42.5
Consultant	10	10	25
<b>Total</b>	<b>40</b>	<b>40</b>	<b>100</b>

**Source:** Questionnaires survey

From the table above, the result of the research shows that 30 questionnaires were returned. The table reveals that the director has (5) respondents of 12.5% returned questionnaire, supervisor has (8) respondents or 20% returned questionnaire, twelve (17) respondents or 42.50% returned from Project manager, while (10) respondents 25% returned from consultant.

Hence, from the fact and figures shown above, one can analyse that the interference of the study was successfully carried out.

**Table 2 (i): EDUCATIONAL QUALIFICATION**

Qualification	No. Of Response	Percentage
Ph.D	0	0
M.Sc	10	25
B.Sc / HND	20	50
ND	10	25
<b>Total</b>	<b>40</b>	<b>100</b>

**Source:** Questionnaires survey

As shown above, 10 respondents or 25% fall within the M.sc holders, 20 respondents or 50% are B.Sc / HND while other 10 respondents or 25 are ND holders. From the result, it shows that they are highly educated and competent to contribute to the answer.



Table 3 (ii) : PROFESSIONAL RESPONDENTS

Profession	No. Of Responses	Percentage
Architect	10	25
Civil Engineers	10	25
Builder	5	12.5
Quantity Surveyor	10	25
Estate Manager	0	0
Service Engineer	5	12.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

As shown above, 10 respondents or 25% of the sample are architect, 10 respondents or 25% were civil engineers, 5 respondents or 12.5% were builder, 10 respondents or 25% were quantity surveyor, 0 Respondent Or 0% estate valuer and 5 respondent or 5% service engineer. From the result it shows that they are professionally competent.

Table 4 (iii): RESPONDENTS YEARS OF EXPERIENCE IN THE CONSTRUCTION INDUSTRY

Years of experience	No. Of Responses	Percentage
Below 5 years	5	12.5
5 - 10	8	20
11 - 15	10	25
16 - 20	10	25
20 and above	7	17.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

Below 5 years respondent 12.5% of the sample, 5 – 10 years respondent 20% of the sample, 11 – 15 years respondents 25% of the sample, 16 – 20 years respondents 25% of the sample. 20 and above respondents 17.5% of the sample. From the result it shows that they are professional with many years of working experience.

#### ANALYSIS OF DATA

**QUESTION 3:** Have you ever been involved in a project that did not experience delay beyond the original completed date?

Table 5

Option	No. Of Responses	Percentage
Yes	6	15
No	34	85
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

Table 5 above; reveal that 85% of the respondents have been involved in a project that experienced delay beyond the original completion ate while 15% of the respondent has been involved in a project that experiences delay.

**QUESTION 4:** What percentage or projects have been involved in that experience delay?

Table 6

Percentage of project	No. Of Responses	Percentage Response %
>80%	5	12.5
60 - 79%	8	20



40 - 59%	12	30
<40%	15	37.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

#### COMMENT

Table 6 above, reveal that 37.5% of the respondents have experienced such percentage in project delay, as greater than 10% respondents have experienced such project delay, as 12.5% respondents have experienced such percentage in project delay and 40% respondent have experienced project delay.

**QUESTION 5:** Which type of project has the highest case of delays?

**Table 7**

Option	No. Of Responses	Percentage Response %
Government / public section	32	80
Corporate bodies	2	5
Private developers	6	15
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

As could be seen from the table 7 above, 80% of the respondents are of the opinion that the type of the project with the highest case of delays is government, 5% of the respondent opinion is of the private with a low case of delay.

#### QUESTION 6:

Is there any relationship between the sizes of the project to delay?

**Table 8**

Option	No. Of Responses	Percentage Response %
Yes	36	90
No	4	10
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

From the table 8 shows that 90% of the respondents agreed that there is relationship between the sizes of the project to delay, while 10% of the respondent is not of the view that there is relationship between the size of project to delay.

**QUESTION 7:** Who among the construction team is most responsible for delays?

**Table 9**

Option	No. Of Responses	Percentage Response %
Client	20	50
Contractor	15	37.5
Consultant	5	12.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

#### COMMENT

Table 9 above, reveal that 50% of the respondents are of the opinion that client are the most responsible for delays in construction team and 37.5% of the respondent are of the opinion that contractors





are responsible for delays in construction team, while 12.5% respondent are of the opinion that consultant are responsible for delays in construction team.

**QUESTION 8:** The following were identified as factors responsible for delays in construction project. Please rate the significance of these factors in causing delays on the scale of 5 –very significant, 4 – significant, 3 – slightly significant, 2 –partially not significant, 1- not significant.

To know the factors which are most responsible for delays in construction project, we used the “severity index” which is a statistical method used for analysis in order to rank the factors most responsible for delays in construction. These results are summarize and shown better in a retrogressive pattern the factor are very significant, significant, slightly, partially significant, and not significant to delays in construction projects.

$$\text{Severity index} = \frac{\sum_{i=0}^i a_i x_i}{\sum_{i=0}^5 x_i} \times 100\%$$

$a_i$  = constant expressing the weight given to  $i$ ,

$x_i$  = variable expressing the frequency of the response for  $i = 1, 2, 3, 4, 5$  and is illustrated as follows:  $x_1$  = frequency of not significant (NS), response  $x_2$  = frequency of partially not significant (PNS), responses  $x_3$  = slightly significant (SS), responses  $x_4$  = significant (S), responses  $x_5$  = very significant. E.g. mode of financing and payment for complete work.

$$\frac{1(0) + 2(0) + 3(2) + 4(13) + 5(15)}{5(0 + 0 + 2 + 13)} = \frac{133}{3(30)} \times 100 = \frac{104 \times 100}{150}$$

Index = 88.67

None compliance with conditions of contract

$$\frac{1(0) + 2(0) + 3(2) + 4(13) + 5(15)}{5(0 + 0 + 2 + 13)} = \frac{104}{3(30)} = \frac{104 \times 100}{150}$$

Index = 69.33

**Table 10**

S/N	Factors responsible for delays in construction project	Response	Response	Response	Response	Response	Index	Rank
1	Mode of financing and payment for complete work	15	13	2	0	0	88.67	1
2	Poor site management	14	10	6	0	0	85.33	2
3	Underestimation of time for project	10	15	5	0	0	83.33	3
4	Improper planning	12	9	6	3	0	80.00	4
5	Disputes on site	10	12	5	3	0	79.33	5
6	Frequent changes in design and materials (variation)	6	16	8	0	0	78.67	6
7	Mistakes during construction	6	15	7	2	0	76.67	7
8	Non compliance with conditions of contract	12	9	6	3	0	69.33	8





9	Lack of co-ordination between contractor and design team	8	0	20	2	0	69.33	9
10	Government policy	0	12	18	0	0	68.00	10
11	Choice of materials not readily available	4	11	7	8	0	67.33	11
12	Litigation	0	18	7	0	5	65.33	12
13	Preparation and approval of variation orders	0	5	25	0	0	63.33	13
14	Changing construction techniques to unfamiliar ones	1	18	4	2	6	62.67	14
15	Delays caused by subcontractors and suppliers	0	2	23	5	0	58.00	15
16	Relationship between management and labour	0	8	12	7	3	56.67	16
17	Lack of proper incentives to operatives	1	5	3	17	4	48.00	17
18	Inadequate supply of labour	1	10	3	1	15	47.33	18
19	Contractor handling work than on more than on site	1	6	3	12	8	46.67	19
20	Maintenance work on machinery / plant	1	2	8	12	8	42.67	20

**SOURCE:** Survey questionnaire

#### COMMENT

The results of the study are shown in table 10 and show the combined significant factors. Five factors rank highest among the 20 factors that are responsible for delays in constructions project.

1. Mode of financing and payment for complete work which is a very significant factor responsible for delays in construction project. (88.67) using severity index formula.
2. Poor site management (85.33) has been ranked and found out that it is significant factor responsible for delays in construction using severity index formula.
3. Underestimation of time for project (83.33) was ranked and found that it is a significant factor responsible for delays in construction using severity index formula
4. Improper planning (80) (significant)
5. Disputes on site (79.33)( significant)

**QUESTION 9:** Do you agree that the scheduling technique used to contributes to delays in construction project?



Table 10.1

Option	No. Of Responses	Percentage Response %
Strongly agreed	12	30
Agree	25	62.5
Disagree	3	7.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

**COMMENT:** From the above table, 30% of the respondents strongly agreed that there is scheduling techniques that contribute to delay in construction, 62.5% agreed that there is scheduling techniques that contributes to delay in construction while 7.5% disagree that there is no scheduling techniques that contribute to delay in construction

**QUESTION 10:** which of the following scheduling techniques makes easy detection of delays in project?

Table 11

Option	No. Of Responses	Percentage Response %
Bar Chart	10	25
Network models	28	70
Others	2	5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey

**COMMENT:**

From the table above, it shows that 25% of the respondents are of the opinion that bar is the scheduling technique for easy detection of project, 70% of the respondent agreed that network models is the scheduling technique used for easy detection of delays while 5% are on other.

**QUESTION 11:** Does delays in project lead to general increase in cost of construction?

TABLE 12

No. Of Responses	Percentage Response %
38	95
2	5
<b>40</b>	<b>100</b>

Source: Questionnaires survey

**COMMENT**

From the table above reveals that 100% of the respondents agreed that delay in project lead to general increase in cost of construction.

**QUESTION 12:** Which of these stakeholders is mostly affected by consequences of project delays?

TABLE 12

Option	No. Of Responses	Percentage Response %
Client	25	62.5
Contractor	10	25
Consultant	0	0
End user	5	12.5
<b>Total</b>	<b>40</b>	<b>100</b>

Source: Questionnaires survey



From the table above reveals that 62.5% of the respondents agreed that client are most affected by the consequences of project delay, 25% respondent agreed that it is contractor that are mostly affected, 12.5% of the respondent agreed that it is the end users that are mostly affected

**QUESTION 13:** Do you agree that there is a specific technique for managing delays?

TABLE 13

Option	No. Of Responses	Percentage Response %
Yes	38	95
No	2	5
Total	40	100

Source: Questionnaires survey

**COMMENT**

From the table above 95% of the respondents agreed that there is a specific technique for managing delays while 5% disagree that there is no specific techniques for managing delays.

**QUESTION 14:** the following were identified as techniques for delay recovery in construction project. Draw the level of their effectiveness on a scale 5 – very effective. 4 – Effective, 3 – slightly effective, 2 – partially not effective, 1 not effective.

		5	4	3	2	1		
S/N	Option	Response	Response	Response	Response	Response	Index	Rank
1	Change in logic	10	12	0	6	2	74.67	2
2	Crashing	13	6	6	5	0	78	1
3	Fast tracking / laddering	5	13	10	2	0	74	3

SOURCE: Questionnaire survey

**COMMENT:**

From the table above using the severity indexes in ranking techniques for recovery in construction project, it was discovered the best techniques are:

- Crashing (78)
- Change in logic (74.6)

But among these three techniques, it was found out that the best among them is the crashing technique.

TABLE 14 (ii): SUMMARY OF INDEX AND RANK FOR TECHNIQUES FOR DELAYS RECOVERING

S/N	TECHNIQUES	Index
1	Crashing	78.00
2	Chane in logic	74.67
3	Fast tracking / laddering	74.00

**4.2 TEST OF HYPOTHESIS**

In this research study, two hypotheses are tested. All the hypotheses will be tested using the chi-square.  $\chi^2$  distribution tests the observed by E. The variance will be different between O and E then the summary  $\Sigma$

$$\chi^2 = \frac{\Sigma(O - E)^2}{E}$$

**QUESTION 1:** Does delay in project lead to general increase in cost of construction?

SUBJECT	YES	NO
BSERVED FREQUENCY	40	0
EXPECTED FREQUENCY	100	0



$$\chi^2 = \frac{(30 - 100)^2}{100} + \frac{(0 + 0)^2}{0}$$

$$\chi^2 = \frac{(-70)^2}{100} + 0 = \frac{4900}{100} = 49 + 0$$

Calculated value = 49, table value at 5% significant (0.05).

Ho = Delays in project does not lead to increase in cost of construction

Ha = Delays in project lead to increase in cost of construction

I reject the Ho and accept the H<sub>1</sub>

**QUESTION 2:** Do you agree that there is a specific technique for managing delay?

SUBJECT	YES	NO
BSERVED FREQUENCY	35	5
EXPECTED FREQUENCY	83.33%	16.67%

$$\chi^2 = \frac{(25 - 83.33)^2}{83.33} + \frac{(5 - 16.67)^2}{16.67}$$

$$\chi^2 = \frac{(-58.33)^2}{83.33} + \frac{(-11.67)^2}{16.67}$$

$$\chi^2 = 40.8303 + 8.1697 = 49$$

Calculated value = 49. Level of significance 0.05.

Degree of freedom (R-1) (C-1) = 1

$$(30 - 1) (2 - 1)$$

$$(29) (1) = 29$$

**DECISION RULE** = Accept Ho if calculated value of x<sub>2</sub> is less than critical value.

Since the chi-square calculated value = 49 which is greater than the critical value is 29, we hereby reject.

I reject the Ho and accept the H<sub>1</sub>.

### Results and Discussion

Due to increasing rate of project abandonment, delay in construction project delivery, the researcher deemed it necessary to apply techniques for delay recovery in construction project as a way of the above mentioned problems in construction industry. This project work has been able to identify 20 causes of delay, and determine the effect of delay in project delivery, and also the techniques to recover from delay when it occurs in a construction project.

### Conclusion

A properly organized and controlled project would reduce labour cost, cost associated with management of resources and quantity of project and thereby minimizing delays. The research concludes by stating that greater efforts should be given to: mode of financing and payment for completed work (88.67) by



the client, poor site management (85.33), underestimation of time for project (83.33), improper planning (80) by the contractor, and disputes on reveals as the most important factor causing delays. That delay(s) when it occurs in a project normally leads to general increase in the cost of construction and finally that the application of schedule crashing (78) and change in logic techniques (74.67) proves to be effective in delay recovery.

### **Recommendation**

The following recommendations that can be deduced by this research are as under listed.

1. Client should make adequate provision for project fund and honor interim certificates as and when due to enhance the contractors cash flow and ensure regular progress of work.
2. The consultants should ensure that all the necessary information and scope of work are formed before the award of the contracts to reduce change order.
3. Contractor should employ adequate professional manpower for most of the project.
4. A Quantity Surveyor or scheduling professional should be engaged to appropriate estimation.
5. The contractor should provide a realistic work programmed in network models for prompt analysis of important of delays on the project.
6. In carrying out the test of hypothesis using the chi-square, it was discovered that delay leads to general increase in the cost of construction. They are specific technique in managing delays. Delay in project delivery is better presented at the onset but when it occurs, it should be tackled by crashing and change in logic in other to meet the target completion period using severity index.

These recommendations if effectively applied will definitely reduce and help in the recovery of delay on construction.

### **Acknowledgement**

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**Table showing the various firm(s) visited for this research work in Ebonyi state.**

S/N	CONSTRUCTION FIRM(S)	ADDRESS	REMARK
1	Arab Construction Ltd	EgbooAbakalikiEbonyi State	
2	Setraco Construction Ltd	Isiagu Ivo Ebonyi State	
3	Julius Begger Construction Ltd	AkpohalsieluEbonyi State	
4	BOA Construction Ltd	IkwoAbakalikiEbonyi State	
5	Graykon Construction Ltd	Afikpo North Ebonyi State	
6	Mulac Ventures Ltd	Ivo Ebonyi State	
7	Foundation Years Ltd	Ivo Ebonyi State	
8	Obis Associates Ltd	OhaozaraEbonyi State	
9	Mak&Mak Ltd	Ivo Ebonyi State	
10	Chipa Construction Ltd	Ivo Ebonyi State	
11	Vitro Engineering Ltd	Ivo Ebonyi State	
12	Tip Top Nig. Ltd	Ivo Ebonyi State	
13	CBC Global Ltd	Ivo Ebonyi State	
14	Chap Construction Ltd	Ohaozara Ebonyi State	
15	Uxadola& Partner Ltd	Ivo Ebonyi State	
16	Stadecost Consultancy Limited	Ikwo Ebonyi State	
17	Okey Technical Ltd	Afikpo south	
18	Paul B Construction Ltd	Abakaliki Ebonyi State	
19	Civok Construction Ltd	Afikpo South Ebonyi State	
20	Hapel Construction Ltd	Abakaliki Ebonyi State	
21	ALCON Construction Ltd	Abakaliki Ebonyi State	
22	JaavfEdwod Ltd	Abakaliki Ebonyi State	
23	Marum Construction Ltd	Ibii /Afikpo South Ebonyi State	
24	A & O Construction Ltd	Abakaliki Ebonyi State	
25	Arfro Construction Ltd	Abaomege Ebonyi State	
26	Network Consultancy ltd	Abakaliki Ebonyi State	
27	Ministry of work & Transport	Abakaliki & AfikpoEbonyi State	
28	Sperol Construction ltd	Abakaliki Ebonyi State	
29	Bebanicanet Technology Limited	No33 New Market Road Abakaliki Ebonyi State	
30	GobalAllwell Tech. (Nig) Ltd	39 Nna Street Abakaliki Ebonyi State	



31	Edon Group of Company Nig. (Ltd)	N01 Edward Nkwagu Close, Along Ogoja Road Abakaliki	
32	Filez Nig. Ltd	Ochodo city Ebonyi State	
33	UniGlobe Construction Engineering Company	NwueguAbakaliki Ebonyi State	
34	Pyke Engineering Ltd	IkwoAbakalik iEbonyi State	
35	Chanto Engineering Ltd	IkwoAbakaliki Ebonyi State	
36	Heavy Weight Engineering Ltd	IkwoAbakaliki Ebonyi State	
37	Zerox Construction Ltd	IkwoAbakaliki Ebonyi State	
38	Embar Construction Ltd	Afikpo North Ebonyi State	
39	P & O Solid Ltd	Afikpo South Ebonyi State	
40	Ugolanson (Nig) Ltd	Afikpo South Ebonyi State	

Map of Ebonyi State, Nigeria

