

Assessment of Factors Causing Delay on Building Construction Projects in Enugu, Nigeria

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ABSTRACT

The study was to investigate factors responsible for the delay on building construction projects in Enugu State. Delay means non-completion of project within the specified duration agreed upon in the contract. Some building construction projects in Enugu State construction experienced a wide range of delays. The aim of the research study is to develop a delay analysis system for assessing and reducing the impact of delay in Nigeria construction projects in Enugu. The method used primary and secondary data. Primary data were obtained using different Participatory Research Approaches (PRA) including, in-depth interview, focus group discussions and questionnaires. The results revealed the factors that contributed to the causes of delays in building construction project in Enugu State are delay in revising and approving design documents, delays in sub- contractors work, poor communication and coordination, change orders by owner during construction and inadequate contractor's work. Furthermore, delay in approving major changes in the scope of work, shortage of labors; ineffective planning and schedule in execution of project are among the factors with sequence. It is recommended that site management and supervision, effective strategic planning, clear information and communication channels, collaborative working construction and proper project planning and scheduling will reduce the delays on building construction projects in Enugu State in particular and Nigeria at large.

Keywords: Factors causing delay, Building Construction Projects, Enugu State

INTRODUCTION

Several factors can contribute to delays on a project and analyzing the causes of delays is an essential task for ameliorating any potential conflicts or claims (Schumacher 2007). According Assaf and Hazni, (2006), construction delays play a key role in any project success. The delay factors are very crucial within a construction project and it's vital that all stakeholders must have certain knowledge regarding this issue in order for the project to be completed effectively and satisfactorily. Most delays in building construction projects are complicated and many researchers emphasizes on the high cost and the associated risk related to litigating procedures

(Braimah, 2008 ; Long, 2004). The building construction industry in Nigeria has grown significantly over the past years. Lack of understanding across the construction industry is one of the key issues in the industry (Magid, 2006). There is strong evidence of inconsistent performance of Nigeria construction projects both by international firms and local construction contractors (LCC) and the trend is growing rapidly (Naha, 2008).

Building projects are reportedly failing across all the key performance in Nigerian construction industries. According to Theodore et al, (2009), the dramatic shift in the capacity and volume of the Nigerian construction sector over the last decade warrants a systematic analysis of the delays. Mansfield (2013), observed that timely completing of construction project was a signal of project efficiency. However, construction processes depend upon several variables and unpredictable factors that occur from various sources, including performance of involved party, availability of resources, site conditions and contractual conditions. It is therefore imperative to ascertain the key factors impacting delays in the building construction industry and establishes the relationship between the critical attributes for assessing the impact of these factors. There is limited study regarding the intrinsic factors affecting on delays in building construction project in Enugu State, Nigeria. Thus, the study is necessary in an attempt to assess the factors affecting delays on building construction projects in terms of timely delivery.

Materials and Methods

The study used both primary and secondary data. The primary data were obtained using field surveys, In-depth Interview, Focus Group Discussion and Questionnaire administered to the stakeholders (Client, Contractor, Consultant, Materials, Equipment, Labor, External factors) in the construction sector. The questionnaires were structured to elicit much information as possible on the cause of building construction delays in Enugu State. The questionnaire was mainly based on 5 likert's scale level.

1. Strongly disagree
2. Disagree
3. Moderate
4. Agree
5. Strongly agree

DATA ANALYSIS

The data obtained was analyses to determine the relative importance of the various factors that contribute to causes of construction delays. The method for data analysis consist of 2 steps:

RELATIVE IMPORTANCE INDEX (RII)

To determine the ranking of different factors from contractors. Consultants and owners, the relative importance index (RII) was used (Odeh and Battaineh 2005).

$$I = \frac{\sum W_i X_i}{\sum X_i}$$

Where:

I = response category index

W_i = The weight assigned to ith response: 1, 2, 3, 4, 5 respectively.

X_i = frequency of the response given as percentage of the total responses for each factors.

HYPOTHESIS ANALYSIS

To test for hypothesis chi- test statistics was used to determine the significance of the level of importance attached to factors causing delays in building construction project (Odeh and Battaineh, 2005).

$$X^2 = \frac{(O-\Sigma)^2}{\Sigma} + \frac{(O-\Sigma)^2}{\Sigma}$$

Where:

X² = chi – square

O = observed frequency

Σ = expected frequency

RESULT AND DISCUSSION

Table 4.1 showed the total number of questionnaires distributed to contractors and consultants. About seventy (70) questionnaires were distributed to the targeted respondents in order to identify the most important factors that cause delays in building construction project in Enugu State. The survey questionnaires were distributed to the contractors and consultants who took part in various construction site in Enugu. The questionnaire was completed by experienced director's project managers, project engineers, site managers and designers. The total number of questionnaires distribution and responses has been analyzed and shown in table below:

Table 4.1: Questionnaire Distribution and Responses

DISTRIBUTION	NUMBER OF DISTRIBUTED	NUMBER OF RESPONDENTS	PERCENTAGE OF NUMBER OF RESPONSES
Contractor	45	18	52.94
Consultant	25	16	47.06
Total	70	34	100

FACTORS AND GROUPS THAT CAUSES DELAYS

Factors that contribute to the delay of building construction project in Enugu State were ranked based on relative importance index (RII) (Frimpong, 2004) from the view point of contractor, consultant and client.

FACTORS OF CLIENT RELATED DELAYS

Table 4.2 shows the results of survey analysis of factors of client related delays. Factors that causes the delays were ranked based on relative important index (RII) between group of respondenst of contractor and consultant. Delay in revising and approving design documents was contributed the most for client related delays by contractor and consultants. Besides that, change order by owner during construction was ranked second in overall while delay in approving shop drawing and sample materials rank third. Delay in revising and approving design documents ranked first as the most important factor that cause construction delays, the design documents is needed as a reference for the project and also act as a permit so that contractor does not proceed

the construction without permission and wasting money for unnecessary site activity. Next, the change orders by owner during construction was ranked second highest among the client related delays group. According to Alaghbani 2007, change orders in frequent might extend the site activity and affect the whole project scheduling which comes to unable to complete the project on time. Thirdly, delay in approving shop drawing and sample materials which might postpone the site activity to the back and delay the whole project schedules.

TABLE 4.2: The result of factors of client related delays.

FACTORS	CONTRACTORS		CONSULTANTS		OVERALL	
	INDEX	RANKS	INDEX	RANK	INDEX	RANK
Delay in revising and approving design document	3.56	1	3.38	1	3.47	1
Change orders by owner during construction	3.50	2	3.25	3	3.38	2
Delay in approving shop drawing and sample material	3.44	3	3.00	9	3.22	3
Slowness in decision making process	3.11	5	3.31	2	3.21	4
Poor communication and coordination	3.28	4	3.13	5	3.20	5
Conflict between joint - Ownership of the project	2.94	6	3.25	3	3.10	6
Delay to furnish and deliver the site	2.89	7	3.13	5	3.01	7
Suspension of work by owner	2.72	8	3.06	8	2.89	8
Delay in progress payment	2.61	9	3.13	5	2.87	9

FACTORS OF CONTRACTOR RELATED DELAYS

Table 4.3 showed that respondents agreed on the factors based on relative important index (RII). Contractors ranked conflicts in sub-contractors schedule in execution of project and inadequate contractor’s work as top of all the contractors released factors. While consultant agreed that poor communication and coordination factors as the most important factor that caused delays in construction projects. Also, poor qualification of the contractor’s technical staff as the least contributing to construction delays. Ahmed, (2000) reported that though contractors and consultants are working in the same sector, but their working responsibility are totally different. This is the main reason that both contractors and consultant have different point of view of the contractor related delays factors. In overall, delay in sub- contractor’s work was ranked top while poor communication and inadequate contractors work were ranked second and third. The quality of sub- contractor’s work was highly dependent for the construction to proceed faster; otherwise it may delay the construction project. Effective communication and coordination is essential to develop a good team work which may indirectly give a successful to the project (Sambassien and Soon 2007). Furthermore, inadequate contractor’s work not only will cause the time overrun but also cost overrun. The construction site activity need to redo or demolish as the contraction project does not fulfill the requirement.

Table 4.3: the result of factors of contractor related delays

Factors	contractor		consultants		overall	
	Index	Rank	Index	Rank	Index	Rank
Delay in sub - contractor work	3.06	3	3.81	2	3.43	1
Poor communication and Coordination	2.83	9	3.94	1	3.39	2
Inadequate contractors work	3.11	1	3.63	4	3.37	3
Conflicts in Subcontractors schedule	2.94	6	3.75	3	3.35	4

in execution of project						
Improper contractor methods implement	3.06	3	3.50	8	3.28	6
Frequent change of Subcontractors	2.89	8	3.63	4	3.26	7
Rework due to errors during construction	2.94	6	3.56	6	3.25	8
Conflicts between contractor and other parties	3.00	5	3.50	8	3.25	9
Difficulties in financing project	2.83	9	3.50	8	3.11	10
Delay in site mobilization	2.61	11	3.38	12	2.99	11
Poor qualification of contractor's technical staff.	2.39	12	3.50	8	2.94	12

FACTORS OF CONSULTANT RELATED DELAYS

Table 4.4: shows the results of survey analysis of factors of consultant's related delays. Factors that causes the delays were ranked based on relative importance index between respondents of contractor and consultant. Due to different job point of view for contractors and consultants, their rank have a big gap if compare with each other. For example, contractors ranked the un- use of advanced engineering design software as the first choice to contributing the construction delays for suit consultant related delays while the survey from consultants had stated that this factor would be the least contributing among the consultant related factors.

TABLE 4.4: the result of factors of consultant related delays

FACTORS	CONTRACTORS		CONSULTANT		OVERALL	
	index	rank	index	rank	index	rank
Delay in approving major changes in the scope of work	3.33	4	3.38	1	3.35	1
Mistake and discrepancies in design document	3.50	2	3.06	3	3.28	2
Un-use of advanced engineering design software	3.78	1	2.63	8	3.2	3
Unclear and inadequate details in drawings	3.39	3	2.94	4	3.16	4
Delay in producing design documents	3.28	5	2.94	4	3.11	5
Insufficient data collection and survey before design	2.94	7	3.13	-2	3.03	6
Poor communication and co - ordination	3.06	6	2.94	4	3.00	7
Inadequate experience of consultants	2.83	8	2.81	7	2.82	8

FACTORS OF MATERIAL RELATED DELAYS

Table 4.5 showed factors that contributed to the causes of delays related to material delays. These factors were identified and ranked from the viewpoint of contractors and consultants. The delay in material delivery was ranked first for contractors and consultants. This is the most important factor that affects the construction delays. Besides that, the storage of construction materials is and changes in material during the construction project can have negative impact on the project.. bassioni and EL-Razak, (2008) observed that damage of certain materials while there are needed urgently can cause unnecessary delaying of any projects. These factors can be said as the least influence to the construction delay under the factor of material related delays. Delays in material delivery will affect the cash flow and scheduling while the problem of shortage of construction material at local market, generally, related to material transportation problems to the local market from the place of material production or material distribution centre.

TABLE 4.5: The result of factors of material related delays

FACTOR	CONTRACTORS		CONSULTANT		OVERALL	
	index	rank	index	rank	index	rank
Delay in material delivery	2.89	1	3.38	1	3.13	1
Shortage of construction material in market	2.83	3	3.31	2	3.07	2
Changes in material types during construction	2.83	3	3.31	2	3.07	2
Delay in manufacturing special building materials	2.89	1	3.19	4	3.04	4
Late procurement of materials	2.78	5	3.19	4	2.98	5
Damage of sorted material while there are needed urgently	2.56	6	3.00	6	2.78	6

FACTORS OF LABOUR RELATED DELAYS

As show in table 4.6, there are five factors related delays were ranked based on relative importance index (RII) from the perceptive of contractor and consultants. Shortage of labors was ranked in first for contractors and consultants. Besides that, the working permit of labors was ranked in second for contractors and third for consultants. The personal conflict among labors was ranked fourth for both contractor and consultants. The shortage of labor can slow down the project progress due to low productivity of site activity (Chan and Kumarasiymy, 2007). In addition, labor productivity is typically measured as a ration of output per labor- hour, an input.

If the low quality of labor is being occupied, therefore it might affect the project schedule and cause the project to delay.

TABLE 4.6: the Result of Factors of labor related delays

FACTORS	CONTRACTOR		CONSULTANT		OVERALL	
	index	rank	index	rank	index	rank
Shortage of labors	3.33	1	3.38	1	3.35	1
Low productivity level of labors	2.89	3	3.1	2	3.04	2
Working permit of labors	3.00	3	3.00	3	3.00	3
Personal conflicts among labors	2.39	4	2.75	4	2.57	4

FACTORS OF EQUIPMENT RELATED DELAYS

In table 4.7, shows the results of survey analysis of factors of equipment related delays. Factors of causes of delays were ranked based on relative importance index from the view point of contractor and consultant. This factor of equipment related delays have some different view point among contractors and consultants. Although contractors thought the low level of equipment operator’s skill would be the most factors that affects the construction delays but consultants have ranked lack of high technology mechanical equipment as their first choice. Breakdowns equipment was the least among all the factors that able to affect the construction delays. The

lack of high technology of mechanical equipment is related to low productivity and efficiency of equipment which is particularly true due to old model equipment not able to produce high production and frequent equipment breakdown problem.

TABLE 4.7: the result of factors of equipment related delays

FACTORS	CONTRACTORS		CONSULTANTS		OVERALL	
	index	rank	index	rank	index	rank
Equipment related						
Lack of high - technology mechanical equipment	2.61	2	3.25	1	2.93	1
Low productivity and efficiency of equipment	2.61		3.19	2	2.9	2
Low level of equipment operator's skill	2.72	1	3.06	1	2.89	3
Shortage of equipment	2.61	2	3.06	3	2.84	4
Equipment breakdown	2.5	5	2.88	5	2.69	5

FACTORS OF EXTERNAL RELATED DELAYS

Factors of external related delays that contributed to the causes of delays were ranked based on relative importance index (RII) between contractors and consultants as shown in table 4.8. Contractors ranked environmental factors (subsurface and ground conditions), weather conditions on construction activities, and changes in government regulations and law as the most external related delay factors while consultants rank delay in providing services from utilities, effect of subsurface and ground conditions, and delay in obtaining permits from municipality as the most related factors. According to Ogundala (2006) , subsurface and ground condition can

be considered as the most important external factors that affect the construction delays. If the ground condition is not stable, mean the foundation work are not able to start as settlement might occur in future time. Moreover, weather effect such as thunder storm might affect the construction activity due to safety consideration.

TABLE 4.8: The Result of Factors of External Related Delays

FACTORS	CONTRACTORS		CONSULTANTS		OVERALL	
	index	rank	index	rank	index	rank
Effects of Subsurface and ground conditions	3.11	1	2.88	2	2.99	1
Weather effect on construction activities	2.83	2	2.75	4	2.79	2
Delay in providing services from municipalities	2.5	8	2.94	1	2.72	3
Delay in obtaining permit from municipalities (bureaucracy)	2.61	6	2.81	3	2.71	4
Traffic control and restriction at job site	2.67	4	2.75	4	2.71	5
Charges in government regulations and cars	2.83	2	2.5	7	2.67	6
Delay in performing final	2.67	4	2.63	6	2.65	7
Inspection during construction						
Accident during construction	2.56	7	2.25	8	2.4	8

DISCUSSION

Based on the results, the major factors that contributed to the causes of delays in building construction projects in Enugu State were delay in revising and approving design documents, delays in sub- contractors work, poor communication and coordination, change orders by owner during construction and inadequate contractor's work. Other factors include, delay in approving major changes in the scope of work, shortage of labors; ineffective planning and schedule in execution of project are among the top ten ranked factors with sequence. The contractor's related delays factor in building construction project recorded 85% from the respondent. While the client related delays factor had 65. The results of research revealed that the site management and supervision, effective strategic planning, clear information and communication channels, collaborative working construction and proper project planning and scheduling can reduce the delay in building construction projects in Enugu State by contractors and consultants. The site management and supervision is the most important factor. In construction projects, coordination among the various professionals, supervise construction quality and standard compliance will ensure that the contractors meets the required timetables, without attempting to take shortcuts or deviate from budgetary test to ensure that the material used are those agreed to the contract and they meet the standards. Moreover, the strategic planning is important for Construction Company as it will give the direction and measurement tools needed to be competitive in the industry. Among various type of construction, the influence of market pressure on the timing of initiating a facility is most obvious in industrial construction. In order to gain time, effective strategic planning is needed to precede the project without any major mistakes. Communication is essential when managing activities. Communication is the passing on of ideas and information, therefore site supervisor must ensure that their workers are able to understand his command before starts any site activities.

Conclusion

The major delays groups were identified and ranked, which group of contractor related delays in the top main groups that contribute to the causes of delays. The top five most important factors causing delays are factors of delay in revising and approving design documents, delays in sub-contractors work, poor communication and coordination, change orders by owner during construction and inadequate contractors work. To minimize delays in construction project, effective strategic planning, site management and supervision and clear information and communication channels are recommended

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