CAUSES AND EFFECT OF DELAY ON PROJECT CONSTRUCTION DELIVERY TIME

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ABSTRACT

Delay is one of the biggest problems often experienced on construction project sites. Delays can instigates negative effects such as increased costs, loss of productivity and revenue many lawsuits between owners and contractors and contract termination. The aim of this project is to investigate the causes and effects of delay on building construction project delivery time. Random sampling technique was used in this study. Population sample of 150 was used in this work. A total sample of ninety three (93) was deployed. A structured questionnaire in Likert scale was used in data collection. There are many factors that induce delay on construction projects, however in some of identified factors includes: lack of funds to finance the project to completion, changes in drawings, lack of effective communication among the parties involved , lack of adequate information from consultants, slow decision making and contractor's insolvency, variations among others. Also, project management problem, mistake and discrepancies in contract document, equipment availability and failure, mistakes during construction, bad weather, fluctuation in prices of building materials, inappropriate overall organizational structure linking to the project and labour. The factors above could be observed and could be a clue to preventing delay on construction sites.

KEY WORDS *Delay, Construction, Delivery, Construction, Effects.*

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INTRODUCTION

Construction industry in Nigeria is faced with a lot of problems, among which is delay in project execution. It has been researched, that delay is a major setback in the construction industry in Nigeria. The problem of delays in the construction industry is a global phenomenon. In Nigeria, it was observed that the performance of the construction industry in terms of time was poor. Odeyinka and Yusif (1997) have shown that seven out of ten projects surveyed in Nigeria suffered

delays in their execution. Chan and Kumaraswamy [1997] studied delays in Hong Kong construction industry. They emphasized that timely delivery of projects within budget and to the level of quality standard specified by the client is an index of successful project delivery. Failure to achieve targeted time, budgeted cost and specified quality result in various unexpected negative effects on the projects Normally, when the projects are delayed, they are either extended or accelerated and therefore, incur additional cost. The normal practices usually allow a percentage of the project cost as a contingency allowance in the contract price and this allowance is usually based on judgment. Although the contract parties agreed upon the extra time and cost associated with delay, in many cases there were problems between the owner and contractor as to whether the contractor was entitled to claim the extra cost. Such situations, usually involved questioning the facts, causal factors and contract interpretation. Therefore, delays in construction projects give rise to dissatisfaction to all the parties involved and the main role of the project manager is to make sure that the projects are completed within the budgeted time and cost.

REVIEW OF PAST RESEARCH EFFORTS IN CAUSES AND EFFECTS OF DELAY IN CONSTRUCTION PROJECT DELIVERIES

A few selected related articles were presented in this section on causes and effects of delay on construction works. Yates (2003) studied construction delays, the study developed a decision support system for construction delay analysis called (DAS). The main categories of delays in DAS according to the study, includes engineering, equipment, external delays, labour, management, material, owner, subcontractors, and weather.

Similarly, Mansfield et al., (1994) studied the causes of delay and cost overrun in construction projects in Nigeria. The results showed that the most important factors are financing and payment for completed works, poor contract management, changes in site conditions, shortage of material, and improper planning.

Also, Odeh and Battaineh (1999), and Battaineh (1999) evaluated the progress reports of 164 building and 28 highway projects constructed during the period 1996-1999 in Jordan. The results indicate that delays are extensive: the average ratio of actual completion time to the planned contract duration is 160.5% for road projects and 120.3% for building projects. Likewise, Al-Momani (2000), conducted a quantitative analysis of construction delays by examining the records of 130 public building projects constructed in Jordan during the period of 1990-1997. The researcher presented regression models of the relationship between actual and planned project duration for different types of building facilities. The analysis also included the reported frequencies of time extensions for the different causes of delays. The researcher concluded that the main causes of delay in construction projects relate to designers, user changes, weather, site conditions, late deliveries, economic conditions, and increase in quantities.

Moreover, Assaf, Al-Khalil, & Al-Hazmi, (1995) for example, provide a concise summary of the methodologies used by transportation agencies to establish the contract duration used for highway construction projects, and also provides a schedule guide for field engineers during construction. 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 stages of the project.

In another related study, Wilson (1992) examined the role of the owner and architect/engineer's roles in the prevention and resolution of construction claims. Wilson also summarized the causes of construction claims which include: extra work, project delays and acceleration, lack of management, limited site access and change in work schedule.

Divakar k. & Dr 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 information and activity contributions.

Leishman, D.M. (1993) presented a paper which discussed different delay analysis techniques that are currently used by practitioners in the construction industry. It also discusses a proposed new delay analysis technique called the isolated Delay Type (IDT). These techniques were tested against a case example and their strengths and weaknesses highlighted.

Empirically based time performance research measures either construction time (physical building time) or contract time (performance measured against the date stipulated in contracts). Finally, Bromilow (1998) developed cost and time model that could be used to evaluate delay oin projects. One outcome of this study was the development of an empirical relationship between total cost of construction and project duration. The equation describing the average duration as a function of value is T = KCb, where 'T' equals the construction period from possession of site to practical completion in days, 'C' is the final adjusted project value, 'K' is a constant describing how time performance is affected by size, and 'b' a constant indicative of the sensitivity of time performance of cost level. This established the parameters of cost/time performance predictability, although the performance of the individual projects varied significantly.

The relationship was re-tested by Bromilow (1998) in collaboration with the Australian Institute of Quantity Surveyors (AIQS) in two follow-up contract time performance studies, in 1976 and 1988. The former study investigated 408 projects built between 1990 and 1996 and found they despite evidence of greater variation between the time performance of projects of similar value, 'the relationship between construction duration and project cost uncovered in the 1960s still holds.' The 1988 study investigated 408 projects built between 1976 and 1986. It found that the average contract time was about 32% for government contracts and 22% for private contracts (Bromilow, Hinds, & Moody 1998).

2.3 UNDERSTANDING THE CONCEPT OF DELAYS IN PROJECT

Many studies have attempted to identify the causes that put construction projects behind planned schedule. For example, Baldwin and Manthei 1971 investigated delay causes in building projects in the United States. Sullivan and Harris 1986 examined delay causes in large construction projects in the United Kingdom. Kaming et al., (1997) analysed the causes of time and cost overruns in high-rise construction projects in Indonesia; Odeh and Battaineh (2002) investigated delay causes in large construction projects in Jordan. The causes identified included design changes, poor labour

productivity, and inadequate planning. Furthermore, previous studies showed that delays can be caused by owners, planners/designers, contractors, or acts of God. However, most studies focused mainly on identifying delay causes in the construction phase, rarely emphasizing on the planning and design phases.

McManus et al., 1996, who evaluated delay causes in architectural construction projects, concluded that many delays manifest during all project phases and primarily occur during the construction phase; however delays that start in the design phase include inadequate schedule control by architects, inability of owners to review design in a timely manner, late incorporation of emerging technologies into a design, and ineffective coordination and/or inclusion of project user groups. Basu 2005 identified 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) studied construction delays in Thailand. They found that the problems faced by the construction industry in developing economies like Thailand could be: (a) shortages or inadequacies in industry infrastructure (mainly supply of resources); (b) caused by clients and consultants and (c) caused by contractor's incompetence/inadequacies. They recommended that there should be concerted effort by economy managers and construction industry associations to provide the necessary infrastructure for efficient project management.

Chan and Kumaraswamy(2008) conducted a survey to determine and evaluate the relative importance of the significant factors causing delays in Hong Kong construction projects. They analysed and ranked main reasons for delays and classified them into two groups: (a) the role of the parties in the local construction industry (i.e. whether client, consultants or contractors) and (b) the type of projects.

Results indicated that five major causes of delays were: poor site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client initiated variations and necessary variations of works. Odeyinka and Yusif (1997) have addressed the causes of delays in building projects in Nigeria. They classified the causes of delay as project participants and extraneous factors. Client-related delays included variation in orders, slow decision-making and cash flow problems. Contractor-related delays identified were: financial difficulties, material management problems, planning and scheduling problems, inadequate site inspection, equipment management problems and shortage of manpower. Extraneous causes of delay identified were: inclement weather, acts of nature, labour disputes and strikes. Al-Momani(2000), carried out a quantitative analysis on construction delays in Jordan. The result of his study indicated that the main causes of delay in construction of public projects were related to designers, user changes, weather, site conditions, late deliveries, economic conditions and increase in quantity. Similarly, Odeh and Battaineh also conducted a survey aimed at identifying the most important causes of delays in construction projects with traditional type of contracts from the viewpoint of construction contractors and consultants. Results of the survey indicated that contractors and consultants agreed that owner interference, inadequate contractor experience, financing and payments, labour productivity, slow decision making, improper planning, and subcontractors were among the top ten most important factors. Frimpong et. al., conducted a survey

to identify and evaluate the relative importance of significant factors contributing to delay and cost overruns in Ground water construction project.

METHODOLOGY

Random sampling technique was used in this study. Population sample of 150 was used in this work. A total sample of ninety three (93) was deployed. A structured questionnaire in Likert scale was used in data collection.

PERCENTAGE COMPOSITION OF RESPONDENTS' PROFESSION

Table 4.1 Results of profession of respondents

S/N	PARTICULAR	FREQUENCY	PERCENTAGE (%)
1.	Quantity Surveyor	19	21.1
2.	Architect	8	8.9
3.	Engineer	38	42.2
4.	Builder	24	26.7
5.	Other	1	1.1
6.	Total	90	100%

Source: Field Survey (2013)

In this study, purposive sampling was used in selecting the respondents, 150 professionals in the construction industry were selected, and ninety three (93) numbers of those selected were able to return the questionnaire, while three (3) of the ninety three (93) were ignored for incorrect entry.

Based on the response obtained from Table 4.1, (19) 21.1% of the respondents are quantity surveyors, (8) 8.9% of the respondents are Architects, (38) 42.2% are Engineers, and (24) 26.7% of the respondents are Builders while (1) 1.1% of the respondents fall on others.

From the analysis above, the engineer had the highest percentage among the respondent while the builder has 26.7%. The combination of this professional give ample response to the information been sought which further validate the outcome of the analysis

Table 4.2 Result of respondents' educational qualification

S/N	PARTICULAR	FREQUENCY	PERCENTAGE (%)
1.	O.N.D	0	0%
2.	H.N.D	14	15.6%
3.	B.S.C	48	53.3%
4.	M.sc	25	27.8%
5.	M.B.A	0	0%
6.	P.H.D	3	3.3%
7.	TOTAL	90	100%

Source: Field Survey (2013)

Table 4.2 shows that (0) 0% of the respondent had O.N.D meaning that none of the respondents had O.N.D result, (14) 15.6% of the respondents are H.N.D holders, (48) 53.3% of the respondents are

B.S.C holders, (25) 27.8% of the respondents are M.S.C holders, none of the respondent had M.B.A, while (3) 3.3% of the respondent had P.H.D

Table 4.3 results of professional qualification of respondents

S/N	PARTICULAR	FREQUENCY	PERCENTAGE
1.	MNIQS	14	15.6%
2.	FNIQS	1	1.1%
3.	MNIOB	12	13.3%
4.	FNIOB	6	6.7%
5.	MNSE	13	14.4%
6.	FNSE	3	3.3%
7.	OTHER	41	45.6%
8.	TOTAL	90	100%

Source: Field survey (2013)

On the result of the percentage of respondents having their professional qualification we have (14) 15.6% of the respondent MNIQS, (1) 1.1% of the respondents have professional qualification of FNIQS, (12) 13.3% respondent have qualification of MNIOB, (6) 6.7% of respondent have qualification of FNIOB, (13) 14.4% of the respondent have qualification of MNSE, (3) 3.3% of the respondent had qualification of FNSE while (41)45.6% fell on other qualifications.

Respondent with various types of qualification are more than other professionals, therefore form a base for robust data.

Table 4.4 Percentage of years of working experience of the respondents

S/N	PARTICULAR	FREQUENCY	PERCENTAGE
1.	Less than 5 years	29	32.2%
2.	5-10 years	32	35.6%
3.	11-15 years	9	10%
4.	16-20 years	7	7.8%
5.	20yrs and above	13	14.4%

Source: Field Survey (2013)

On the percentage of years of working experience of the respondents, (29) 32.2% of the respondents have less than 5 years working experience, (32) 35.6% of the respondents have 5-10 years working experience, `(9) 10% of the respondents have 11-15 years working experience,(7) 7.8% of the respondents have 16-20 years working experience, (13) 14.4% of the respondents have twenty (20) yrs. and above working experience.

Table 4.5 percentages of types of project respondents have been involved in.

S/N	PARTICULAR	FREQUENCY	PERCENTAGE
1.	Residential	72	35.3%
2.	Office	55	27%
3.	Industrial	25	12.3%
4.	Civil	31	15.2%
5.	Institutional	21	10.3%
6.	Total	204	100%

Source: Field Survey (2013)

The table above shows the types of project respondents have been involved into. (72) 35.3% of the respondents have been involved with residential construction projects, (55)27% of the respondents have been involved with office construction projects, (25)12.3% of the respondents have been involved in the construction of industrial areas, (31) 15.2% of the respondents have been involved with civil works, and (21) 10.3% have been involved with the construction of institutional buildings.

Table: 4.6 Highest percentages of causes of delay

S/N	PARTICULAR	FREQUENCY	PERCENTAGE
1.	Client	46	51.1%
2.	Consultant	12	13.3%
3.	Contractor	32	35.6%
4.	Total	90	100%

Source: Field Survey (2013)

Table 4.6 above shows a table showing the highest percentage of causes of delay amongst the client, consultant and the contractor. (46) 51.1% of the respondent attested to the fact that the clients are have the highest percentage of the causes of delay, (12) 13.3% of the respondent attested to the fact that the consultant has the highest percentage of causes of delay, while (32)35.6% of the respondents attested to the fact that the contractor has the highest percentage of causes of delay.

4.7 Factors Causing Delay In Construction Projects

No	**Causes of Delay**	**Strongly agreed**	**agreed**	**Strongly disagreed**	**disagreed**	**undecided**	**MIS**	**RANK**
1.	Lack of fund to finance the project to completion	56(62.2%)	30(33.3%)	0	1(1.1%)	3(3.3%)	0.9	1
2	Slow decision making	23(25.6%)	50(55.6%)	3(3.3%)	3(3.3%)	11(12.2%)	0.758	5

3	Fluctuation in prices of building materials	11(12.2%)	43(47.78%)	10(11.1%)	13(14.4%)	13(14.4%)	0.658	13
4	Mistake during construction stage.	13(14.4%)	45(50%)	8(8.89%)	6(6.67%)	18(20%)	0.664	11
5	Equipment availability and failure	19(21.1%)	42(46.67%)	5(5.56%)	5(5.56%)	19(21.1%)	0.682	10
6	Mistake and discrepancies in contract document.	18(20%)	45(50%)	7(7.78%)	77.78%)	13(14.4)	0.706	9
7	Bad weather	20(22.2%)	34(37.78%)	11(12.2%)	4(4.4%)	21(23.3%)	0.662	12
8	Lack of effective communication among the parties involved	27(30%)	44(48.89%)	5(5.56%)	3(3.3%)	11(12.2%)	0.762	3
9	Labour strike	10(11.11%)	22(24.4%)	15(16.67)	24(26.67%)	18(20%)	0.553	15
10	Changes in drawings	25(27.78%)	50(55.56%)	5(5.56%)	0	10(11.1%)	0.78	2
11	variations	19(21.1%)	51(56.67%)	4(4.444%)	3(3.333%)	13(14.44)	0.733	7
12	Lack of adequate information from consultants	26(28.89%)	44(48.89%)	7(7.78%)	2(2.2%)	11(12.2%)	0.76	4
13	Project management problem	19(21.1%)	50(55.56%)	4(4.4%)	4(4.4%)	13(14.4%)	0.73	8
14	Inappropriate overall organizational structure linking to the project	14(15.56%)	42(46.67%)	7(7.78%)	9(10%)	18(20%)	0.656	14

15	Contractor's insolvency	28(31.1%)	39(43.3%)	8(8.89%)	3(3.3%)	12(13.3%)	0.751	6

Source: Field Survey (2013)

Factors causing delay in construction project is presented in Table 4.7. Lack of funds to finance the project to completion with 0.9 mean index score is suggested as the most preferred factor as causing delay on construction projects. This is closely followed by the changes in drawings having 0.78, and then lack of effective communication among the parties involved having the MIS value of 0.762. Furthermore lack of adequate information from consultants having the MIS of 0.76 is ranked 4th, funds is the most essential factor for a project to be executed appropriately. Changes in drawing can incur increase in cost of work and also delay in execution of work and it could also cause slow decision making which ranged 5th with MIS of 0.758, contractor's insolvency having MIS of 0.75 could also occur seen his time is been increased he tends to spend more and may run into debt causing there to be variation having MIS of 0.73, followed by project management problem having MIS of 0.72. mistake and discrepancies in contact document having MIS of 0.71 has lots of effect on project, Equipment availability and failure having MIS of 0.68 could reduce the effectiveness of work and can cause misuse of manpower , mistake during construction stage having MIS of 0.664 is very risky. It could cause collapse and incur more cost, bad weather having MIS of 0.662 been natural happenings, also has the tendency of affecting work on site, next is fluctuation in prices of building materials with MIS of 0.658 could either increase cost or decease depending on the market at the time. Inappropriate overall organizational structure linking to the project having MIS of 0.656 affects every aspect of work on site, labour strike having the least causes with MIS of 0.55. Strike rarely occur on site only if the workers are not been paid there salary that is when strike occurs.

Table 4.8 : Effects of Delay on Construction Projects

No	**Effects of delay**	**Strongly agreed**	**Agreed**	**Strongly disagreed**	**disagreed**	**undecided**	**MIS**	**Rank**
1	Time overrun	53(58.89%)	29(32.2%)	1(1.1%)	4(4.4%)	3(3.3%)	0.8778	1
2	Increase in final cost of project	49(54.4%)	31(34.4%)	3(3.3%)	2(2.2%)	5(5.6%)	0.86	2
3	Tying down of client capital due to non-completion of the project	43(47.8%)	30(33.3%)	5(5.6%)	2(2.2%)	10(11.1%)	0.81	4
4	Wastage and under-utilization	29(32.2%)	51(56.7%)	3(3.3%)	2((2.2%)	17(18.9%)	0.842	3

	of man-power and resources							
5	Abandonment of building project	36(40%)	28(31.1%)	10(11.1%)	2(2.2%)	14(15.6%)	0.756	6
6	Reduced profit	36(40%)	30(33.3%)	5(5.6%)	6(6.7%)	13(14.4%)	0.756	7
7	Dispute between parties involved	21(23.3%)	49(54.4%)	5(5.6%)	6(6.7%)	17(18.9%)	0.767	5
8	Litigation	28(31.1%)	37(41.1%)	4(4.4%)	3(3.3%)	18(20%)	0.72	8
9	Arbitration	25(27.8%)	39(43.3%)	4(4.4%)	2(2.2%)	20(22.2%)	0.704	9

Source: Field Survey (2013)

Results from Table 4.8 shows that Time overrun ranked the highest with mean index score value of 0.87, while increase in final cost of project is ranked second with mean index score of 0.86. Wastage and under- utilization of man-power and resources had MIS value of 0.84. Time in every phase of life is really essential, when a contract is done and the date is given, the effect of delay really affects time and as the adage goes time is money. Time affects every other factor, the increase in final cost; more money has to be spent. Delay will also cause wastage and underutilization of man power and resource. Tying down of client capital due to non-completion of the project is scored with MIS value of 0.81 because; the client cannot get his money back if the work is not completed. Dispute among parties involved, litigation and arbitration were ranked the least with MIS values 0.77, 0.72 and 0.7 respectively. There is a close interrelation among the factors that were ranked least. Dispute among parties involved can induce litigation and arbitration and if the decision of the arbitration panel is not acceptable to either of the parties involved, this can lead to big time legal battle which can truncate the progress of the work.

SUMMARY OF FINDINGS

The outcome of analysis from this study can be said to be of great relevance to the construction industry. Majority of the respondents are fully involved in the construction industry with at least 10 years of construction experience, meaning that the respondents have wealth of knowledge and could supply the necessary information on the question sent out in the questionnaires. The professionals represented were the client having the highest percentage of 51.1% of causes of delay in construction project followed by the contractors having 35.5% then the consultants having the least percentage of 13.3%.

There are many factors that induce delay on construction projects, however in this study the factors are limited to 15 factors causing delay and they were ranked according to the mean index score. The factors includes: lack of funds to finance the project to completion, changes in drawings, lack of effective communication among the parties involved , lack of adequate information from consultants, slow decision making and contractor’s insolvency, variations. Also, project management problem, mistake and discrepancies in contract document, equipment availability and

failure, mistakes during construction, bad weather, fluctuation in prices of building materials, inappropriate overall organizational structure linking to the project and labour strike.

Analysis was also carried out on the effect of delay on the project work. Time overrun, increase in final cost of project, wastage and under-utilization of man-power and resources, tying down of client capital due to non-completion of the project, dispute among parties involved were ranked highest. Time is factor that is very essential in all activities that has to be carried out, in the contract document a specific time phase is given for delivery of project and if the time is being exceeded more money is often spent which could lead to increase in final cost of project and also wastage and under-utilization of man-power and resources. The client's capital has to be withheld due to non-completion of the project which could result into dispute, litigation and arbitration among the workers and management. Also delay can lead to reduced profit for builder and abandonment of building project by the client.

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