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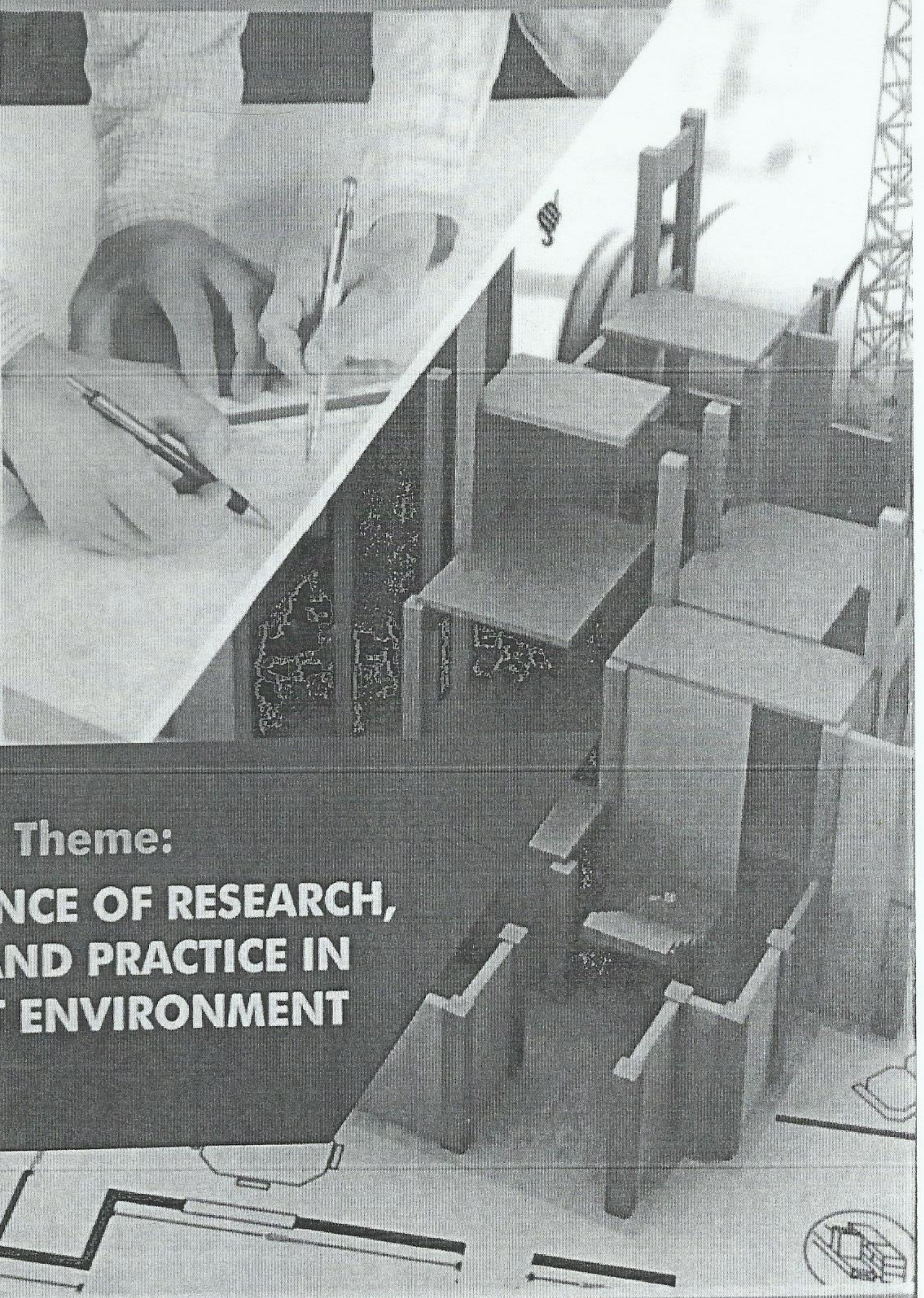

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ANALYSIS OF PRINCIPAL FACTORS CONTRIBUTING TO CONSTRUCTION DELAYS IN TETFUND-SPONSORED TERTIARY INSTITUTION PROJECTS IN ENUGU STATE

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ABSTRACT

Delays in construction projects delivery have become a recurring issue across the globe. The aim of this study was to identify the principal causes of construction delays, the effect of delays and methods of minimizing them in four tertiary institutions' "Tetfund-sponsored" projects in Enugu State. Survey technique with area sampling and purposive project selection methods were used to select four executed projects in UNTH, UNEC, IMT and ESCET. The research design comprised extensive literature scan. This facilitated the development and issue of 5-point Likert scale questionnaires with 56 delay causing variables grouped in 8 sections, to 91 respondents drawn from clients, contractors and consultants/stakeholders of the respective projects. 78 numbers duly filled and returned questions were relevant. The data collected were presented in tables, and analyzed using descriptive importance index and relative importance index methods. The results showed that the topmost important factors that contributed to the causes of delays are: shortage of manpower and materials, improper planning, financial difficulties of contractors, delay payment of completed works, inclement weather condition, slow decision making, inadequate contractor experience, interim payment difficulties, inaccurate drawings/specifications and inaccurate cost estimate and excessive clients' change orders. To minimize construction delays, it recommended among others, the provision of adequate sources/size of finance and construction resources, use of competent contractors/consultants and prompt payment of certificates.

Keywords: Analysis, Delays, Frequency, Severity, Tetfund project, Minimization.

1.0 INTRODUCTION

Construction project is fraught with risks and uncertainties. Delay is one of the risk or uncertainty variables of construction. Project construction delay can be described as a situation where by the contractors, consultants, clients/stakeholders and fortuitous events jointly or severally contribute to the non-completion of the project within the originally agreed contract period. Delay in construction is time overrun, resulting in completion of project beyond the date of delivery agreed by the contracting parties. Hence delay technically means, to make something happen later than expected or cause work to be performed later than planned in an untimely manner (Mahdavinjad and Molaee, 2011). Ajator (2017), posited that early analysis /planning for management of delays is an ascribed delays as one of the risk and uncertainty variables that have to be astutely managed. The insidious thing about delay is that it fuels cost overrun and disputes, among other negative impacts.

Department of environment (2008) cited in Odeyinka (2018), revealed delay risks/uncertainties and their great push effect on cost of Sydney Opera House in Australia. The project started in 1958 and was planned to complete in 3 years (1961) but delayed by forces of uncertainty to complete over 10 years later in 1973 with cost overrunning from $7million to $102 million i.e. 1357% higher. The critical delay factors in the project span from numerous design changes change in government, adversarial relationships of the project team members, resignation of the design architect etc. Similarly, construction uncertainty delays obtained in the construction of the Scottish Parliament Building (Johnson, 2010; Odeyinka, 2018). The building commenced in 1999 to complete in 2001 at planned cost of £55 million. But completion was delayed 3 years due to over 2000 design changes, change of project site, wrong procurement method, communication breakdown among the client, architect, quantity surveyors, engineers and contractors etc., causing construction cost to overrun from £55 million to £431 million.

Many Nigeria pubic project construction delivery delays, present worse-case scenarios than the Opera House and Scottish parliament projects portrayed above. Odeyinka and Yusuf (1997) observed that seven out of every 10 projects in Nigeria suffer delays with huge "drag-on" costs. These create great lose of value-adding to the national economy and wasteful application of the scarce tax-payers money, and disproportionate allocation to meet diverse sectorial needs of the economy (Ajator, 2014, 2017b; Ogunsemi, 2015). They militate against the realization of the planned GDP and GNP growth targets and by extention the achïevement of economic recovery and growth plans of the various governments of Nigeria. These make delays in construction, especially in Nigeria public sector projects critical "development-impeding" factors that deserve serious frequent investigations. This informs the choice of this research.

Objective

The objective of the research is therefore crafted to analyze the principal delay factors in construction, measure their frequency and impact severity, especially in public projects sponsored by TETFund in Enugu state, and evolve viable strategies for minimizing and managing the delays.

2.0 LITERATURE

Concepts of Delays, Effects of Delays and Minimization of Delays

2.1 Concept of Delay:

"Delay" has become a household word in construction development circle. Delays result from poor work plan and construction methodology, force majeure, poor administration, poor financing and withheld payments, low skill/productivity, schedule slippages, late completion of projects etc. They increase among others, time-related costs, third-party claims, chance of determination and/or abandonment of contracts. It is pertinent for management to plan and keep track of project progress to identify and minimize the spate of delays (Ajator, 2012, 2017a; Obodo and Obodo, 2016). Construction project is assumed successful when it completes on; time, budget, specified quality, at managed risk levels, with all stakeholders meeting their anticipated objectives on the project (Ajator, 2017; Majid, 2006). The construction industry has poor reputation for managing delays. Delay analysis is either ignored or performed subjectively by merely adding a contingency, thus resulting in failure of projects to meet schedule deadlines.

In construction, "time" is critical as it translates to "costs". Time overrun lead to cost overrun, ceteris paribus. Therefor predicting and managing the likelihood of schedule delay, play a key role in project success (Ajator, 2017b; Luu, Kim, Van and Ogunlana, 2009), by averting the more sensitive and severe problems of cost overrun. The reports of several other researches (Bramble and Callahan, 1992; Almomani, 2000; Elinwa and Joshua, 2001; Al-Tababai, 2002; Assaf and Alhajji, 2006; Al-Kharashi and Skitmore, 2009; Ashwini and Rahul, 2013; Anup and Muhamad, 2015), allude to this fact.

Specifically, the studies of (Frimpong, et. al, 2003; Alaghbari, Kadir, Salim and Ernawati, 2007; Sweis, et. al., 2008; Fugar and Agyakwah-Baah, 2010), attributed project delays and cost over-run to poor financing and delay payment for completed works. Ogunlana, Promkungtong and Vithool (1996), ascribed delays/cost overrun to poor contract management. While (Mansfield, Ugwu and Doran, 1994; and Al-Momani, 2000) link them to changes in site conditions. Ogunlana et. al (1996), blame causality on shortage of materials. Mansfield et. al (1994) and Xiao and Proverbs (2002) reports, posit design changes. Frimpong et. al (2003) link delay and cost overrun to adverse weather conditions among others.

Chalabi and Camp (1984) maintain that delays and cost overrun originate early at formulation/planning stages with client held responsible if his actions or inactions breach stated or implied contract conditions. For instance, failure of client or his consultants to provide timely/accurate information or details according to the terms of the contract. Issuing approvals, signing contracts and allowing unencumbered site access among others (Bromilow, 1974). Contractor on the other hand bears risks of time overrun associated with low productivity (Makulsawatudom, .Emsley and Sinthawanarong, 2004; Enshassi et al., 2004), inadequate scheduling/mismanagement, construction mistakes, inappropriate technology, equipment breakdowns, poor labour skills and staffing problems etc. Of course, there are delays caused by fortuitous factors or force majeures e.g. Exceptionally inclement weather, civil commotion, industrial unrest, etc.

Makulsawatudom et. al (2004) established 10 most significant factors affecting construction productivity in Thailand to include: lack of materials, incomplete drawings, incompetent supervisions, lack of tools/equipment, absenteeism, communication gap, late instruction, poor site layout, inspection delay and rework. Lowered construction productivity leads to schedule slippages and ultimately to delayed completion. While Enshassi, et. al. (2007) report on projects in Gazastrip, listed five most important factors that negatively impacted productivity as: material shortages, inexperienced labour, lack of labour surveillance, and drawing/specification changes at execution. In Nigeria, Ameh and Odusami (2002) among others listed low wages, lack of materials and unfriendly work relations to negatively impact craftsmen productivity in in-situ concrete operation.

2.1.1 Types of Delay in Construction Projects

Many researchers (Ahmed, Azhar, Castillo and Kappagantula, 2002; Elinwa and Joshua, 2001) have exposed various types of construction delays as; excusable, non-excusable, concurrent, compensable, non-compensable and critical delays which may be either internally or externally caused. Internally caused delays, some claimed, arise from clients', contractors' and consultants' actions or inactions while external delays originate from outside, such as utility companies, government, subcontractors, suppliers, labour unions etc. This portrayal of external delays seems inadequate as subcontractors/nominated suppliers are still part of the contractors' responsibility.

Alkass, Mazerolle and Harris (1996) and Braimah, (2008) assessing delays from the perspective of contractor emphasized Excusable and non-Excusable delays as key (see figure 2.1 and figure 2.2).

Excusable Delays

Excusable delays are those that excuse contractor from performing within the contract. They are attributable to failing of the client or his agents, and justify an extension of time with payment of compensation for uncovered costs to the contractor.

Excusable Non-Compensable Delay

These may emanate from fortuitous events, to be borne by client without compensation to contractor, other than extension of time. Such events are not caused by actions or negligence of contractor or client and are beyond contractor's control, but may affect even the non-critical activities and thus require detail analysis to determine suitable level of extension of time over that savable by skillful management of floats (Ajator, 2015; Alkass et al., 1996). This underlines the relevance of application Critical Path Method (CPM).

Excusable Compensable Delays

Sambasivan and Soon (2009), Fugar and Agyakwah-Baah (2010) aligning with (Braimah, 2008) above, contrasted excusable compensable delays as those caused by the owner and or his agents for which the contractor must be compensated for damages, possibly by costs and extension of time for extended indirect field office costs and unabsorbed head office overhead costs. Yates and Epstein (2006) agreeing with Alkass et al. (1996) listed circumstance that would lead to excusable compensable delays as:

- Failure of the owner to make the worksite available to contractor in a timely manner.
- Owner-initiated changes in the work.
- Owner delays in issuing a notice to proceed.
- Architect/engineer supplied designs which are defective.
- Owner not properly coordinating the work of other contractors.
- Owner not providing "client-supplied" equipment timely.
- Owner providing misleading information.
- Owner interfering with the performance of the contractor.
- Owner (Architect/engineer), delaying the approval of contractor-submitted shop drawings or using shop drawing process to change contract requirement.
- Contractor encountering differing site conditions etc.

Non-Excusable Delays

Non-excusable delays are caused solely by the contractor and his agents (see figures 2.1 and 2.2; Fugar et. al., 2010). The contractor is not entitled to relief (ie non-compensable) and must make up the lost time by expedition or pay liquidated/ascertained damages (agreed/measured loss of client from the delay) to the client (Sambasivan and Soon, 2007). The non-excusable delays may result from contractor's underestimation of; productivity, improper project planning/scheduling, poor site management/supervision erroneous construction methods, equipment breakdowns, unreliable subcontractors or suppliers and poor project organization structure and non-implementation of work safety measurers (Ajator, 2016).

Independent, Serial and Concurrent Delays

Braimah (2008) also highlighted the use of "independent delays", "serial delays" and "concurrent delays". Independent delays are those that occur in isolation, not simultaneous with other delay sources. Serial delays occur in sequence/consecutively and not overlapping on a particular network path.

Concurrent delays is where two or more separate delay events occur at the same time period (Reynolds and Revay, 2001) e.g. delay from client occurring simultaneously with delay by contractor. In such inextricably

Intertwined causes, the contractor cannot be held liable, nor recover delay damages from the owner (Ahmed et al., 2002). Resolution of concurrent days has been technically/legally contentious in construction and engineering contracts (SCL, 2002).

2.1.2 Causes of Construction Delays in Government Projects

Several highlighted studies reveal that these delay causes emanate largely from actions or inactions of project participants, local contractors/industry under-capacity/skill levels, socio-economic and cultural issues and project characteristic. They include among others:

Client Related Factors; Client characteristics, project financing, their variations and requirements and interim payments to contractors.

Project-Related Factors; Project characteristics, necessary variations, communication levels, speed of decision making by all project teams and ground conditions.

Design Team-Related Factors; e.g. design team experience, project design, complexity, mistakes and delays in producing design documents.

Contractor-Related Factors; Contractor experience in planning and controlling projects, site management/supervisions, degree of subcontracting and their cash-flows.

Materials- Related Factors; Shortages, materials changes, procurement programming and level of off-site prefabrication.

Labour- Related Factors; Labour shortages, low skill levels, weak motivation and low productivity.

Plant/Equipment- Related Factors; Shortages, low efficiencies, breakdowns and incorrect selections.

External Factors; Act of God, inclement weather condition, forex issues, price fluctuations, government regulation, problem with neighbor, unforeseen site condition, civil disturbance, slow processing of building approvals/restive work environment.

2.1.3 Group Causes of Delay

The cited studies above attempted to group the causes of delays from their individual perspectives, with the benefit of determining/aggregating factors with common characteristics under each group.

Our review of their respective groupings which we have operationalized in this study to help us realize the study objectives is shown below with 56 delay causing factors under 8 groups:

1. Contractor Related Delays: Poor site management and supervision; financial difficulties; unsuitable construction method; mistakes during construction; inadequate contractor experience; defective works; poor subcontractor performance and improper planning.

2. Client Related Delays: Client interference, slow decision making, contract modification, change order, financial difficulties of client, uncooperative client, and slow payment of completed work, unrealistic contract duration.

3. Consultant Related Delays: Mistakes in design, changes in drawings and specifications, incomplete documentation (Drawings), defects in design, inadequate supervision of contractor, delay of work approval, late issue of instruction, slow correction of design problem, late valuation of work, slow inspection of completed works.

4. Material Related Delays: Shortage of materials, material procurement problem, material fabrication delay, unforeseen material damages, slow delivery of ordered materials, and noncompliance of material to specification.

5. Contract-Relationship Related Delays: Conflict between parties, difficulties of coordination of parties, lack of communication between parties.

6. Plant/Equipment Related Delays: equipment shortage, wrong selection, low efficiency, equipment delivery problem, inadequate skill of operators, equipment breakdown/maintenance problem.

7. Labour Related Delays: Labour dispute/strikes, weak motivation, and lack of skilled labour, low productivity, shortage of manpower, labour injuries, accident on site, absenteeism.

8. External Factors: Act of God, inclement weather condition, price fluctuation, government regulation, problem with neighbour, unforeseen site condition, civil disturbance, slow process of building permit.

2.1.4 Delay Responsibility/Reward

The summative views of the reviewed studies on reward for delays are that for:

- **Owner Caused Delay:** contractor is granted time extension and possible costs of extension.
- **Contractor/subcontractors/suppliers caused delays:** The contractor is not granted time extension or cost reward but may pay damages/penalties.
- **Neither Party Delay (Force Majeure):** contractor receives time extension to complete without cost payment and no damages/penalties assessed.
- **Both parties' delay;** contactor receives time extension without cost payment and no damages/penalties assessed.

2.2 Effects of Construction Delays

The analyzed/elicited views of the reviews, present seven major effects of construction delays: time overrun, cost overrun, dispute, arbitration, litigation, abandonment, and determination.

2.3 Methods of Minimizing Construction Project Delays

Many insightful studies (Chan and Kumarasamy, 1997; Aibinu and Jagboro, 2002; Ahmed, 2002; Odeh and Battaineh, 2002; Abdul-Rahamam et. al., 2006 and Majid, 2006) have recommended various ways of minimizing construction project delays. Majid (2006) in his delay study of Indonesia Acheh project listed 35 strategies for minimizing construction delays. Similarly, Kaliba, Muya and Mumba (2009) in the study of schedule delays in Zambia projects, recommended 23 approaches to minimizing construction delays.

Also Nguyen, Ogunlana and Lan (2004), studied the project success factors in Vietnam construction and recommended the following delay minimization strategies: competent project manager, multidisciplinary/ competent project team, availability of resources, commitment to projects, frequent progress meeting, accurate initial cost estimates, accurate initial time estimates, awarding bids to the right/experienced consultants and contractors, community involvement, systematic control mechanism, comprehensive contract documentation, effective strategic planning, clear information and communication channels, use of up-to-date technology and absence of bureaucracy(see tables 2.3 and 2.4).

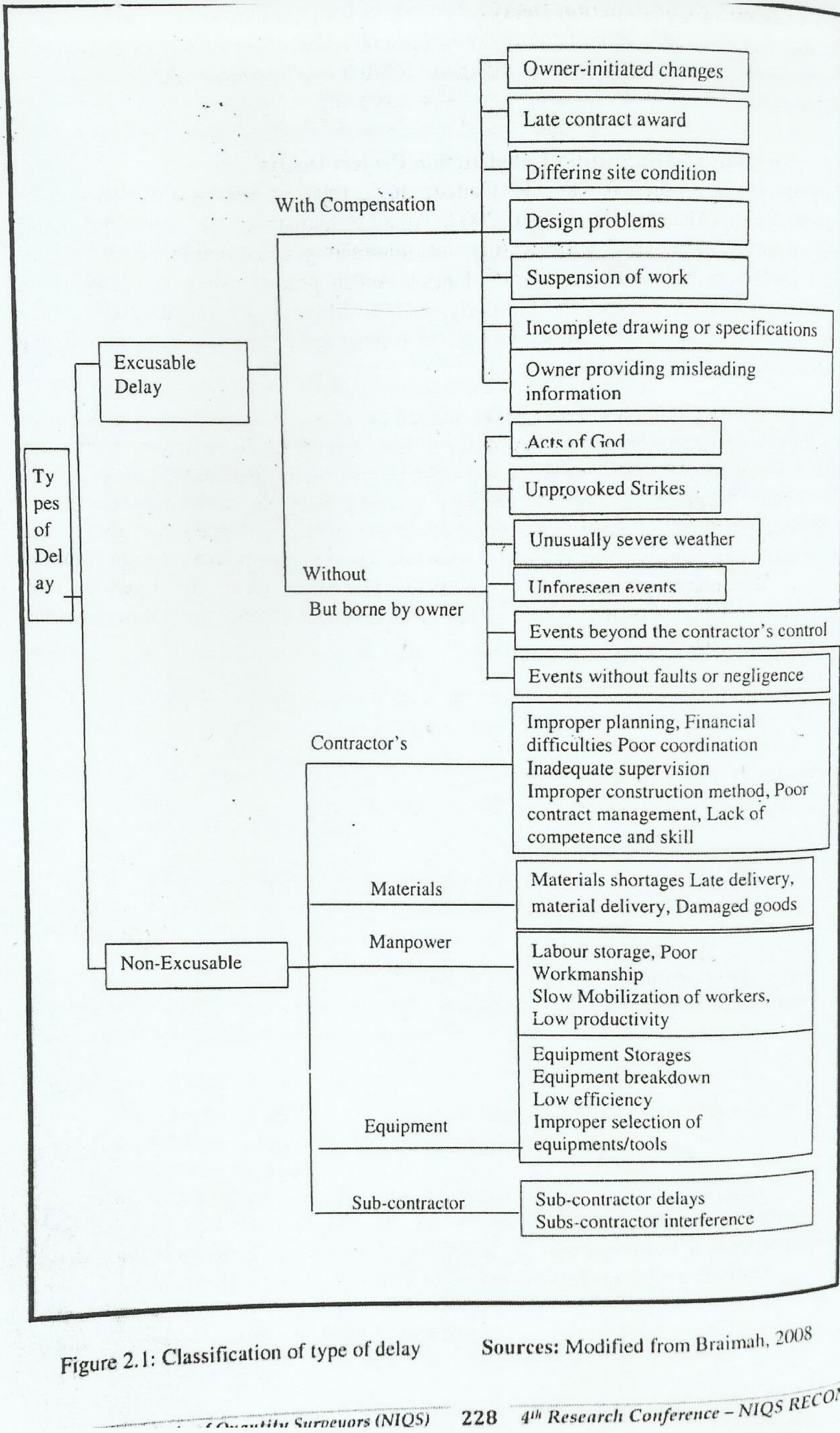

Figure 2.1: Classification of type of delay **Sources:** Modified from Braimah, 2008

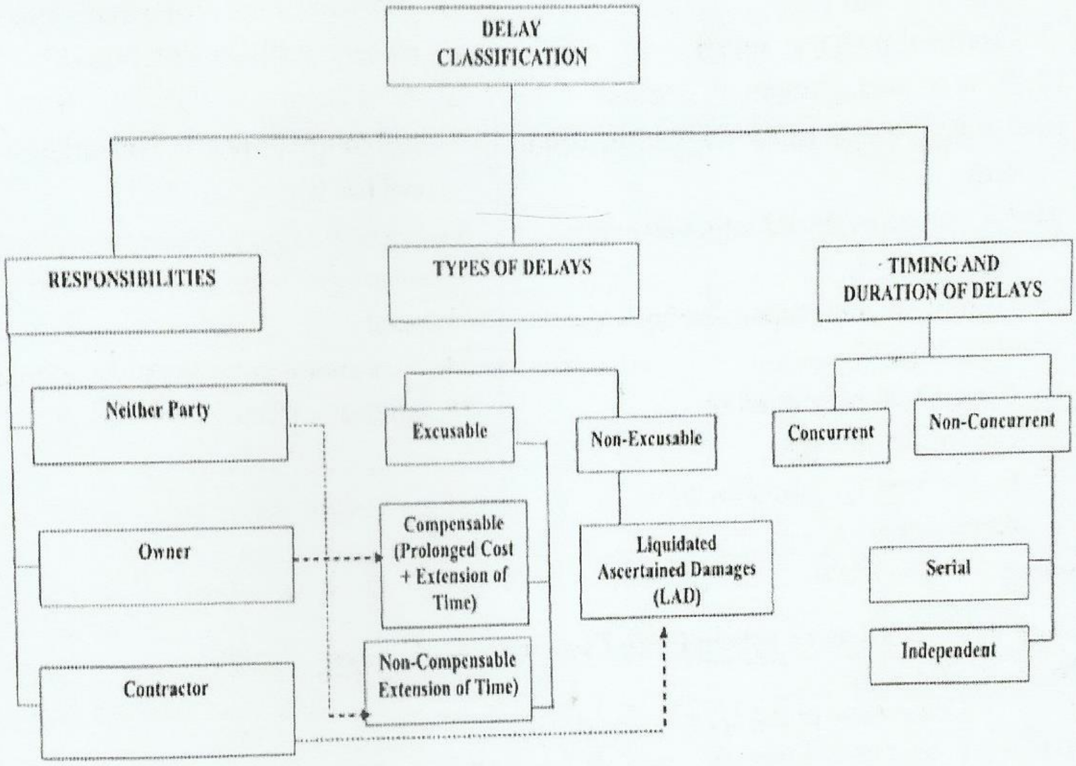

Figure 2.2: Classification of Construction Project Delays **Source:** Modified from Braimah, 2008

Table 2.3: 35 Methods of Minimizing Construction Delays

1. Competent project manager;	18. Site management and supervision
2. Ensure adequate and available source of finance	19. Use of proper and modern construction equipment
3. Multidisciplinary/competent project team;	20. Proper project planning and scheduling
4. Availability of resources	21. Accurate initial cost estimates
5. Commitment to project	22. Use of appropriate construction methods
6. Adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contactors	23. Community involvement 24. Proper emphasis on past experience 25. Frequent coordination between the parties involved
7. Adopting new approaches to contracting such as Design-Building (D/B) and Construction Manager (CM) type of contract	26. Absence of bureaucracy 27. Clear information and communication channels 28. Accurate initial time estimates

8. Complete and accurate project feasibility study and site investigation 9. Acceleration of site clearance 10. Comprehensive contract documentation 11. Frequent progress meeting 12. Project management assistance 13. Use/up to date technology utilization; and 14. Use of experienced subcontractors and suppliers 15. Complete and proper design at the right time 16. Competent personnel of consultant/designer 17. Competent and capable client's representative	29. Proper material procurement 30. Development of human resources in the construction industry through proper training 31. Allocation of sufficient time and money at the design phase 32. Awarding bids to the right/experience consultant and contractor 33. Perform a preconstruction planning of project tasks and resources' needs 34. Systematic control mechanism and 35. Effective strategic planning.

Source: Majid (2006)

Table 2.4: Methods of Minimizing Construction Delays

No.	Methods
1.	Utilization of the latest construction technology method
2.	Frequent site meeting with all functional parties
3.	Not awarding contract based on the lowest bid
4.	Increase productivity by working overtime, shift, etc
5.	Offer incentive for early project completion
6.	Ask for extension of time
7.	Execute delayed activities by subcontractors
8.	Promote team working among project participants
9.	Developing human resources management (training, day courses, etc)
10.	Timely decision making by all functional group
11.	Proper project planning and scheduling
12.	Developing appropriate communication system linking to all functional group
13.	Early in obtaining permit and approval from relevant authority
14.	Thorough project feasibility study and site investigation
15.	Accurate initial project cost estimation
16.	Hire experience personnel for project implementation
17.	Build a systematic project control and monitoring mechanism
18.	Absence of bureaucracy
19.	Proper emphasis on past experience of project parties
20.	Accurate initial time estimation
21	Ensure the availability of resources (finance, materials, equipment, workmen, etc)
22.	Select the competent project manager
23.	Use the appropriate construction methods

Source: Kaliba, Muya and Mumba (2009)

2.4 Operationalization/Gap of the Reviews

The several highlighted findings of this review are modified/operationalized for use in investigating the principal delay factors, effects and minimization requirements for Tetfund-sponsored projects in Enugu state. The uniqueness of this study is that Tetfund as a tertiary institutions' projects intervention agency, has peculiar financing models to which its projects must conform. Some non-critical delay factors in normal project may assume principal delay causal factors in Tetfund financing protocol, thus necessitating this investigation. This is quite apart of the research country and locational area impact possibilities.

3.0 METHODOLOGY

The objective of this study was to analyze the principal delay factors, establish their effects, in terms of frequency, severity, importance/relative importance indices in Tetfund-sponsored projects in Enugu State and recommend strategies for minimizing the delays.

To achieve this, survey method was used to sample areas in Enugu and purposively select and investigate four institutions' (UNTH, UNEC, IMT and ESCET) projects. Using extensive literature search, 5-point Likert scale questionnaires with 56 delay-causing factors, grouped in 8 sections were evolved and issued to 91 respondents, drawn from; clients, contractors and consultants/stakeholders of the respective projects. 78 number responses [UNTH (28), NUEC (28), IMT (12) and ESCET (10)] were found relevant and used for the study.

The data collected were presented in tables and analyzed using descriptive frequency index (FI), severity index (SI), important index (Imp.I) and relative importance index (RII) models. We first established the frequency and severity indices of the delay factors (F.I. and S.I) using Microsoft Excel. Frequency index (F.I.) is the weighted product of number of respondents and their assigned Likert weights (1-5) for each delay factor expressed as percentage of the aggregate weighted product for all delay factors in that group. It has similar model for severity index (S.I.) using severity response Likert scale. We next evolved the importance index (Imp. I.) of each delay factor which is the product of its frequency index (F. I.) and severity index (S. I.). Finally, the relative importance index (RII) is evolved using the model:

$$RII = \frac{\sum W}{A \times N}$$

Where:

$\sum$ = Summation
W = The Weighting 1-5 given by respondents to the delay factor
A = The highest weight (ie 5)
N= Total number of the respondents for each delay factor

The principal delay factors for the projects having highest ranking indices in the 8 groups were located with their significant factors compared and the most suitable solutions for minimization proffered for the individual projects. See table 3.1 for the pilot survey data of the studied projects, and likert scale for frequency of occurrence and severity effects.

Pilot Survey of Four Tetfund Sponsored Construction projects in Enugu

S/N	Project	Project Address	Clients	Remarks
A	Construction of Students' Hostel Block A	University of Nigeria Teaching Hospital (UNTH), Enugu State	Tetfund Special Presidential Intervention 2014 (NEEDS Phase 1)	Started in 2015 but was Completed in 2017
B	Proposal Construction of 75 Room Student's Hostel	University of Nigeria, Enugu Campus (UNEC), Enugu State	Tetfund Special Presidential Intervention 2014 (NEEDS Phase 1)	Still Under Construction as at December 2017
C	Construction of School of Technology Building	Institute of Management and Technology (IMT), Enugu	Tetfund Special Intervention 2009/2010/2011	Started in 2010 but was Completed in 2016
D	Construction of Multi-Media Micro Teaching Laboratory	Enugu State College of Education Technical (ESCET), Enugu	Tetfund Special Intervention 2014/2015	Started in 2015 and completed in 2016

Source: field Survey, 2017

LIKERT SCALE FOR CAUSES AND EFFECTS OF DELAYS

Rating Scale for Frequency of Occurrence

Greatly often	5
Often	4
Sometimes	3
Rarely	2
Never	1

Rating Scale for Severity Effect

Very great effects	5
Great effects	4
Moderate effects	3
Slightly effects	2
No affects	1

Delay Factors; Contractor Related Delays	Frequency of Occurrence (F.I.)					Severity of Effect (S.I.)				
Poor site management and supervisor	5	4	3	2	1	5	4	3	2	1
Financial difficulties	5	4	3	2	1	5	4	3	2	1
Unsuitable construction method	5	4	3	2	1	5	4	3	2	1
Mistakes during construction	5	4	3	2	1	5	4	3	2	1
Inadequate contractor experience	5	4	3	2	1	5	4	3	2	1
Defective works	5	4	3	2	1	5	4	3	2	1
Poor subcontractor performance	5	4	3	2	1	5	4	3	2	1
Improper planning	5	4	3	2	1	5	4	3	2	1

The detail analysis and results are presented in section 4.0

4.0 DATA PRESENTATION, ANALYSIS AND DISCUSSION

Table 4.1: Frequency Index, F.I., Severity Index S. I. and Ranks for Contractor-Caused Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Poor site management and supervision	76.83	2	73.78	4
	Financial difficulties	83.17	1	82.61	1
	Unsuitable construction method	59.05	7	58.65	8
	Mistakes during construction	57.14	8	58.65	7
	Inadequate contractor experience	70.18	5	70.00	5
	Defective of works	63.49	6	63.06	6
	Poor subcontractor performance	73.02	4	76.94	2
	Improper planning	76.83	2	76.31	3
Project B: UNEC	Poor site management and supervision	84.29	1	78.45	2
	Financial difficulties	79.72	2	82.37	1
	Unsuitable construction method	66.00	6	58.38	7
	Mistakes during construction	54.24	8	59.38	6
	Inadequate contractor experience	58.16	7	70.88	5
	Defective of works	63.38	5	56.83	8
	Poor subcontractor performance	76.45	4	75.99	4
	Improper planning	77.76	3	77.26	3
Project C: IMT	Poor site management and supervision	27.99	7	28.11	6
	Financial difficulties	25.19	8	29.55	5
	Unsuitable construction method	29.29	6	30.99	3
	Mistakes during construction	31.49	3	28.11	7
	Inadequate contractor experience	34.29	2	30.99	3
	Défective of works	25.89	5	31.71	2
	Poor subcontractor performance	30.79	4	33.15	1
	Improper planning	34.99	1	27.39	8
Project D: **ESCET**	Poor site management and supervision	22.84	6	24.82	4
	Financial difficulties	19.38	8	20.44	8
	Unsuitable construction method	26.99	3	24.09	7
	Mistakes during construction	26.30	4	24.09	6
	Inadequate contractor experience	28.37	1	27.01	2
	Defective of works	20.76	7	25.22	3
	Poor subcontractor performance	25.61	5	24.82	4
	Improper planning	29.76	2	29.20	1

Sources: Field Survey, 2017

Table 4.2: Frequency Index F. I., Severity Index S.I. and Ranks for Client-Caused Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Client interference	72.78	3	68.87	5
	Slow decision making	72.18	5	67.06	6
	Contract modification	63.76	7	67.06	7
	Change order	72.18	4	76.12	3
	Financial difficulties of client	73.38	2	76.72	2
	Uncooperative client	69.77	6	70.08	4
	Slow payment of completed work	76.99	1	77.32	1
	Unrealistic contract duration	5895	8	56.79	8
Project B: UNEC	Client interference	69.26	5	69.35	5
	Slow decision making	82.99	1	75.71	2
	Contract modification	69.26	4	67.62	7
	Change order	77.11	3	69.35	4
	Financial difficulties of client	63.38	6	73.97	3
	Uncooperative client	60.12	7	67.62	6
	Slow payment of completed work	78.41	2	75.71	1
	Unrealistic contract duration	59.46	8	60.68	8
Project C: IMT	Client interference	29.84	5	29.63	6
	Slow decision making	34.38	1	31.85	3
	Contract modification	30.49	4	28.15	7
	Change order	31.14	3	29.63	4
	Financial difficulties of client	29.19	6	31.85	2
	Uncooperative client	27.89	7	36.30	1
	Slow payment of completed work	31.78	2	29.63	5
	Unrealistic contract duration	25.30	8	22.96	8
Project D: ESCET	Client interference	22.84	6	24.82	5
	Slow decision making	19.38	8	20.44	8
	Contract modification	26.99	3	24.09	6
	Change order	26.30	4	24.09	7
	Financial difficulties of client	28.37	2	27.01	1
	Uncooperative client	20.76	7	25.25	3
	Slow payment of completed work	25.61	5	24.82	4
	Unrealistic contract duration	29.76	1	29.20	2

Table 4.3: Frequency Index F. I., Severity Index S.I. and Ranks for Consultant-Caused Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Mistake in design	53.67	9	58.06	4
	Changes in drawings/specifications	60.76	2	56.19	7
	Incomplete documents/drawing	55.19	7	58.06	3
	Defects in design	55.19	5	56.19	5
	Inadequate supervision to contractor	60.76	3	59.46	1
	Delay of work approval	50.63	8	59.00	2
	Late issue of instruction	61.77	2	56.19	6
	Slow correction of design problem	57.72	4	54.78	8
	Late valuation work	55.70	[illegible]	[illegible]	[illegible]

	Slow inspection of completed works	48.61	10	49.16	10
Project B: UNEC	Mistake in design	47.31	9	54.36	6
	Changes in drawings/specifications	68.21	1	62.54	1
	Incomplete documents/drawing	62.16	3	57.73	5
	Defects in design	46.21	10	52.44	7
	Inadequate supervision to contractor	54.46	6	52.44	8
	Delay of work approval	59.41	4	61.10	3
	Late issue of instruction	62.71	2	62.54	2
	Slow correction of design problem	51.16	7	49.07	9
	Late valuation work	58.86	5	59.66	4
	Slow inspection of completed works	49.51	8	48.11	10
Project C: IMT	Mistake in design	27.58	3	29.21	3
	Changes in drawings/specifications	19.36	7	20.95	5
	Incomplete documents/drawing	15.26	10	16.51	9
	Defects in design	24.65	5	26.67	4
	Inadequate supervision to contractor	26.99	4	36.19	1
	Delay of work approval	33.45	1	20.32	8
	Late issue of instruction	32.27	2	34.92	2
	Slow correction of design problem	18.78	8	20.32	6
	Late valuation work	170.02	9	14.60	10
	Slow inspection of completed works	24.65	6	20.32	7
Project D: ESCET	Mistake in design	22.09	4	21.05	3
	Changes in drawings/specifications	15.12	10	16.10	8
	Incomplete documents/drawing	15.12	9	16.10	9
	Defects in design	19.77	5	21.05	4
	Inadequate supervision to contractor	24.42	3	25.39	2
	Delay of work approval	27.33	1	26.01	1
	Late issue of instruction	25.00	2	16.10	7
	Slow correction of design problem	15.70	7	21.05	5
	Late valuation work	15.12	8	16.10	10
	Slow inspection of completed works	20.35	5	21.05	6

Source: Field Survey, 2017

Table 4.4: Frequency Index F. I., Severity Index S.I. and Ranks for Material Related Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Shortage of material	10.67	1	98.15	2
	Material procurement problem	89.57	5	98.91	1
	Material fabrication delay	93.60	3	88.26	6
	Unforeseen material damages	88.76	6	89.02	5
	Slow delivery of ordered materials	94.41	2	91.30	4
	Noncompliance of material to specification	91.99	4	94.35	3
Project B: UNEC	Shortage of material	96.79	1	92.06	1
	Material procurement problem	95.80	2	96.32	2

	Unforeseen material da...	94.81	3	39.98	5
	Slow delivery of ordered materials	84.94	6	93.20	3
	Noncompliance of material to specification				4
Project C: IMT	Shortage of material	45.63	1	45.28	1
	Material procurement problem	41.98	2	41.66	2
	Material fabrication delay	37.41	4	37.13	5
	Unforeseen material damages	38.33	5	35.32	6
	Slow delivery of ordered materials	40.45	3	39.85	4
	Noncompliance of material to specification	36.50	6	40.75	3
Project D: ESCET	Shortage of material	36.94	1	37.27	1
	Material procurement problem	36.04	2	36.36	2
	Material fabrication delay	27.93	6	28.18	6
	Unforeseen material damages	33.33	4	30.91	5
	Slow delivery of ordered materials	34.24	3	32.73	4
	Noncompliance of material to specification	31.51	5	34.55	3

Source: Field Survey, 2017

Table 4.5: Frequency Index F. I., Severity Index S.I. and Ranks for Plant/Equipment Related Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Equipment shortage	96.75	2	98.19	2
	Wrong selection	95.11	3	89.03	5
	Low efficiency	89.37	5	84.87	6
	Equipment delivery problem	91.83	4	95.69	3
	Inadequate skill of operators	85.27	6	91.53	4
	Equipment breakdown and maintenance problem	101.67	1	100.68	1
Project B: UNEC	Equipment shortage	94.9	3	87.71	5
	Wrong selection	80.55	6	84.82	6
	Low efficiency	88.22	5	90.60	4
	Equipment delivery problem	89.18	4	94.46	3
	Inadequate skill of operators	101.64	2	100.24	2
	Equipment breakdown and maintenance problem	105.48	1	101.17	1
Project C: IMT	Equipment shortage	43.71	2	44.10	2
	Wrong selection	41.14	3	34.87	5
	Low efficiency	35.14	5	33.85	6
	Equipment delivery problem	40.29	4	42.05	3
	Inadequate skill of operators	31.71	6	37.95	4
	Equipment breakdown and maintenance problem	48.00	1	47.18	1
Project D: ESCET	Equipment shortage	35.84	2	35.60	2
	Wrong selection	33.53	3	30.37	5
	Low efficiency	28.90	5	29.32	6
	Equipment delivery problem	31.21	4	34.55	3
	Inadequate skill of operators	27.75	6	32.46	4
	Equipment breakdown and maintenance problem	42.77	1	37.70	1

Source: Field Survey, 2017

Table 4.6: Frequency [illegible] Relationship Related Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Conflict between parties	179.53	3	189.07	2
	Difficulties of coordination between parties	186.12	2	191.44	1
	Lack of communication between parties	194.35	1	182.49	3
Project B: UNEC	Conflict between parties	200.24	2	194.04	1
	Difficulties of coordination between parties	173.09	3	177.02	3
	Lack of communication between parties	186.67	1	188.94	2
Project C: IMT	Conflict between parties	86.81	1	80.00	2
	Difficulties of coordination between parties	81.70	2	87.44	1
	Lack of communication between parties	71.49	3	72.56	3
Project D: **ESCET**	Conflict between parties	70.18	1	67.89	2
	Difficulties of coordination between parties	66.67	2	77.06	1
	Lack of communication between parties	63.16	3	55.05	3

Source: Field Survey, 2017

Table 4.7: Frequency Index F. I., Severity Index S.I. and Ranks for Labour Related Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Labour disputes/strikes	72.45	5	77.95	4
	Weak motivation	75.47	4	77.26	5
	Lack of skilled labour	86.04	3	82.05	3
	Low productivity	89.06	2	87.52	2
	Shortage of manpower	98.11	1	98.46	1
	Labour injuries/accident in site	67.92	7	65.64	7
	Absenteeism	70.94	6	71.11	6
Project B: UNEC	Labour disputes/strikes	63.74	7	76.69	4
	Weak motivation	72.85	5	75.25	5
	Lack of skilled labour	91.06	3	78.14	3
	Low productivity	96.52	1	73.80	6
	Shortage of manpower	94.70	2	101.29	1
	Labour injuries/accident in site	67.8	6	68.01	7
	Absenteeism	73.76	4	86.82	2
Project C: IMT	Labour disputes/strikes	27.63	7	35.04	4
	Weak motivation	31.58	4	34.38	5
	Lack of skilled labour	39.47	3	36.36	1
	Low productivity	41.05	1	31.74	6
	Shortage of manpower	40.26	2	36.36	2
	Labour injuries/accident in site	29.21	6	29.75	7
	Absenteeism	30.79	5	36.36	3
Project D: **ESCET**	Labour disputes/strikes	30.51	3	266.67	1
	Weak motivation	35.59	1	166.67	7

	Low productivity	29.66	4	233.33	4
	Shortage of manpower	21.19	7	246.67	3
	Labour injuries/accident in site	25.42	5	200.00	5
	Absenteeism				

Source: Field Survey, 2017

Table 4.8: Frequency Index F. I., Severity Index S.I. and Ranks for External Related Delays

S/N	Causes	F. I.	Rank	S.I.	Rank
Project A: UNTH	Act of God	65.96	6	70.78	3
	Inclement weather condition	78.08	1	75.74	2
	Price fluctuation	65.96	6	79.78	4
	Government regulation	68.65	5	69.53	6
	Problem with communities	74.04	2	70.78	5
	Unforeseen site condition	72.69	3	79.47	1
	Civil disturbance	60.58	7	58.36	8
	Slow process of building permit	74.04	4	64.57	7
Project B: UNEC	Act of God	62.98	6	69.18	3
	Inclement weather condition	84.89	1	72.47	2
	Price fluctuation	62.98	6	69.18	4
	Government regulation	71.20	4	65.88	7
	Problem with communities	78.04	2	68.08	5
	Unforeseen site condition	71.20	5	86.75	1
	Civil disturbance	57.51	7	60.39	8
	Slow process of building permit	71.2	3	68.08	6
Project C: IMT	Act of God	22.43	7	24.22	7
	Inclement weather condition	34.39	3	34.50	2
	Price fluctuation	35.89	2	33.03	3
	Government regulation	29.91	5	32.29	4
	Problem with communities	20.93	8	23.49	9
	Unforeseen site condition	32.90	4	30.83	5
	Civil disturbance	26.17	6	25.69	6
	Slow process of building permit	37.38	1	35.96	1
Project D: ESCET	Act of God	18.12	7	20.13	7
	Inclement weather condition	28.48	3	30.20	1
	Price fluctuation	29.77	2	28.19	3
	Government regulation	24.60	5	27.52	4
	Problem with communities	18.12	8	20.13	6
	Unforeseen site condition	27.18	4	26.17	5
	Civil disturbance	22.65	6	18.79	8
	Slow process of building permit	31.07	1	28.86	2

Source: Field Survey, 2017

Ta[illegible] Delay Causes in the Four Projects

Causes	Project A (UNTH)		Project B (UNEC)		Project C (IMT)		Project D (ESCET)	
	IMP. I	Rank	IMP. I	Rank	IMP. I	Rank	IMP. I	Rank
Financial difficulties of contractor	68.70	3	65.65	4	7.44	16	3.96	16
Poor subcontractor performance	56.18	10	59.09	14	10.20	6	6.36	8
Shortage of manpower	96.59	2	95.92	1	14.63	2	69.21	1
Poor site management/supervision	56.68	8	66.20	3	7.86	15	5.66	13
Slow payment of completed work	59.52	4	59.36	9	9.41	10	6.35	9
Shortage of material	99.78	1	89.10	2	20.66	1	13.77	2
Financial difficulties of client	56.29	9	46.88	13	9.29	11	7.66	5
Change order	54.94	11	53.47	11	9.22	12	6.33	10
Improper planning	58.62	6	60.77	8	9.58	9	8.69	3
Inadequate supervision to contractor	36.12	17	28.55	19	9.77	8	6.20	11
Inadequate contractor experience	49.12	13	41.22	14	10.62	5	7.66	5
Client interference	50.12	12	48.03	12	8.84	13	5.66	12
Late issue of instruction	34.70	19	39.21	15	2.48	20	4.03	15
Defective works	40.03	16	36.01	16	8.21	14	5.30	14
Inclement weather condition	59.13	5	61.52	7	11.86	3	8.61	4
Unforeseen site condition	57.76	7	61.76	6	10.14	7	7.12	6
Incomplete documents/drawing	43.08	15	35.88	18	2.52	19	2.44	18
Slow decision making	48.40	14	63.66	5	10.95	4	3.96	17
Mistake in design	31.16	20	25.71	20	4.056	18	2.43	19
Delay of work approval	35.18	18	36.00	17	6.797	17	7.10	7

Source: Field Survey, 2017

Table … Projects

Causes	Project A F.I	Project A S.I	Project A IMP.I	Project B F.I	Project B S.I	Project B IMP.I	Project C F.I	Project C S.I	Project C IMP.I	Project D F.I	Project D S.I	Project D IMP.I
Financial difficulties of contractor	83.17	82.61	68.707	79.72	82.37	65.665	25.19	29.55	7.4436	19.38	20.44	3.9613
Poor subcontractor performance	73.02	76.94	56.182	76.45	75.99	58.094	30.79	33.15	10.207	25.61	24.82	6.2564
Shortage of manpower	98.11	98.46	96.599	94.7	101.29	95.922	40.26	36.36	14.639	29.66	233.22	69.206
Poor site management/supervision	76.83	73.78	56.685	84.29	78.54	66.201	27.99	28.11	7.868	22.84	4.82	5.6689
Slow payment of completed work	76.99	77.32	59.529	78.41	75.71	59.364	31.78	29.63	9.4164	25.61	24.82	6.3564
Shortage of material	101.7	98.15	99.789	96.79	92.06	89.105	45.63	45.28	20.661	36.94	24.82	13.786
Financial difficulties of client	73.38	76.72	56.297	63.38	73.97	46882	29.19	31.85	9.297	28.37	37.01	7.6627
Change order	72.18	76.12	54.943	77.11	69.35	53.476	31.41	29.63	9.2268	26.3	24.09	6.3357
Improper planning	76.83	76.31	58.629	77.76	77.26	60.077	34.99	27.39	9.5838	29.76	29.2	8.6899
Inadequate supervision to contractor	60.76	59.46	36.128	54.46	52.44	28.559	26.99	36.19	9.7677	24.42	25.39	6.2002
Inadequate contractor experience	70.18	70.00	49.126	58.16	70.88	41.224	34.29	30.99	10.626	22.84	27.01	7.6627
Client interference	72.78	68.87	50.124	69.26	69.35	48.032	29.84	29.63	8.8416	25.00	24.82	5.6689
Late issue of instruction	61.77	56.19	34.709	62.71	62.54	39.219	17.02	14.60	2.4849	20.76	16.10	4.025
Defective works	63.49	63.06	40.037	63.38	56.83	36.019	25.89	31.71	8.2097	28.48	25.55	5.3042
Inclement weather condition	78.08	75.74	59.138	84.89	72.47	61:52	34.39	34.50·	11.865	27.18	30.20	8.601
Unforeseen site condition	72.69	79.47	57.767	71.20	86.75	61.766	32.90	30.83	10.143	15.12	26.17	7.113
Incomplete documents/drawing	55.19	78.06	43.081	62.16	57.73	35.885	15.26	16.51	2.5194	19.38	16.1	2.4343
Slow decision making	72.18	67.06	48.404	82.99	76.71	63.662	34.38	31.85	10.95	15.12	20.44	3.9613
Mistake in design	53.67	58.06	31.161	47.31	54.36	25.718	19.36	20.95	4.0559	27.33	16.1	2.4343
Delay of work approval	59.63	59.00	35.182	59.41	61.10	36.3	33.45	20.32	6.797		26.10	71085

Source: Field Survey, 2017

Table 4.11 Comparison of Relative Importance Index RII of Top 15 Methods of Minimizing the Project Delays

	Project A RII (N 28)		Project B RII (N 28)		Project C RII (N 12)		Project D RII (N 10)	
Utilization of The lasts construction technology method	105	0.750	97	0.693	85	1.417	85	1.700
Frequency site meeting with all functional parties	98	0.700	92	0.657	46	0.767	46	0.920
Offer incentive for early project	111	0.793	80	0.571	40	0.667	40	0.800

scheduling								
Developing appropriate communication system linking to all functional group	0.7 21	8	0.6 64	10	0.7 67	9	0.9 20	9
Early in obtaining permit and approval form relevant authority	0.7 21	8	0.8 57	1	1.0 00	2	1.2 00	2
Through project feasibility study and site investigation	0.7 14	9	0.6 71	9	0.7 83	8	0.9 40	8
Accurate initial project cost estimation	0.7 36	7	0.6 86	8	0.8 00	7	0.9 60	7
Hire experience personnel for project implementation	0.7 57	4	0.6 43	12	0.7 50	10	0.9 00	10
Build a systematic project control and monitoring mechanism	0.7 43	6	0.6 57	11	0.5 00	12	0.6 00	12
Accurate initial time estimation	0.7 93	1	0.6 64	10	0.7 67	9	0.9 20	9
Ensure the availability of resources	0.7 86	2	0.7 71	4	0.9 00	5	1.0 80	5
Select a competent project manager	0.7 71	3	0.7 86	3	0.8 33	6	1.0 00	6
Use the appropriate construction methods	0.7 57	4	0.8 21	2	0.9 50	3	1.1 40	3

Source: Field Survey, 2017

4.1 Analysis, Findings and Discussion

For contractor caused delays, the excel computation result (table 4.1) identified top ranked financial difficulties, as most frequent and most severe for the UNTH project A. Poor site management/supervision and financial difficulties respectively for frequency of occurrence and severity for UNEC project B.

Improper planning and poor subcontractor performance ditto for the IMT project C. And inadequate contractor experience and improper planning ditto for ESCET project D. These results show that contractor delay factors have varying occurrence frequencies and impact significance in the four projects.

For client-caused delays (table 4.2) slow payment of contractor reared topmost in frequency and severity in the UNTH project A. While slow decision making and slow payment, ditto, obtained in UNEC project B. For IMT project C, it was slow decision making and uncooperative client disposition. While unrealistic contract duration and slow payment prevailed in ESCET project D. Here the principal delay factor (frequency and severity) centers around slow payment of contractor, highlighting need for speedy certification/payments, in the four projects. Similar results obtained in the analyzed projects in the literature.

For consultants delays (table 4.3), the principal factors for projects A, are late instructions and inadequate supervision. Changes in drawings/specs for project B. Work approval delay and inadequate supervision for project C and work approval delay for ESCET project. Hence for consultants problems the principal delay factors hover around design changes and work approval delays, implicating the need for initial provision of detail designs and regular supervision/residency services.

Promote team ... participants								
Proper project planning and scheduling	98	0.700	104	0.743	56	0.933	56	1.120
Developing appropriate communication system linking to all functional group	101	0.721	93	0.664	46	0.767	46	0.920
Early in obtaining permit and approval form relevant authority	101	0.721	120	0.857	60	1.000	60	1.200
Through project feasibility study and site investigation	100	0.714	94	0.671	47	0.783	47	0.940
Accurate initial project cost estimation	103	0.736	96	0.686	48	0.800	48	0.960
Hire experience personnel for project implementation	106	0.757	90	0.643	45	0.750	45	0.900
Build a systematic project control and monitoring mechanism	104	0.743	92	0.657	30	0.500	30	0.600
Accurate initial time estimation	111	0.793	93	0.664	46	0.767	46	0.920
Ensure the availability of resources	110	0.786	108	0.771	54	0.900	54	1.080
Select a competent project manager	108	0.771	110	0.785	50	0.833	50	1.000
Use the appropriate construction methods	106	0.757	115	0.821	57	0.950	57	1.400

Source: Field Survey, 2017

eg: $RII = \frac{\sum W}{AxN}$ $\qquad$ $RII = \frac{105}{5 \times 28} = 0.750$

Where:

$\sum$ = Summation

W = The Weighting given to each factor by the respondents (ranging from 1 to 5)

A = The highest weight (ie 5 in this case)

N= The total number of the respondents

where

$\sum W = 105$

A = 5

N 28 in project A

Table 4.12: Comparing Ranking of RII of Top Fifteen Methods of Minimizing Delays in the Four Projects

	Project A (UNTH)		**Project B (UNEC)**		**Project C (IMT)**		**Project D (ESCET)**	
	RII	**Rank**	**RII**	**Rank**	**RII**	**Rank**	**RII**	**Rank**
Utilization of The lasts construction technology method	0.750	5	0.693	7	1.417	1	1.700	1
Frequency site meeting with all functional parties	0.700	10	0.657	11	0.767	9	0.920	9
Offer incentive for early project completion	0.793	1	0.571	13	0.667	11	0.800	11
Promote team working among project participants	0.693	11	0.714	6	0.833	6	1.000	6
Proper project planning and	0.7	10	0.7	5	0.9	4	1.1	4

For material delays (table 4.4), Shortage of material and material procurement had topmost signifance for project A. Similarly, for project B, C and D presenting need for proper material specification, procurement planning and management.

For plant/equipment delays (table 4.5), the principal delay factors for the four projects A-D was equipment breakdown/maintenance problem. This highlights the need for restoration of plant mobilization advance/advance utilization and repayment bond. And establishment of public and private plant/machinery hiring companies (PPP plant/equipment hiring ventures).

For contract relationship related delays (table 4.6) there were closely tied significant factors. While Lack of Communication and parties coordination presented in project A, it was lack of communication and conflict of parties in project B, and conflict and coordination issues for project C and D. This relationship factor has caused great delays and setbacks in many public projects reported in the literature and require serious development of partnering spirit among project professionals.

For labour related delays (table, 4.7), there was fairly staggered significant factors for the four projects. Shortage of manpower for project A, low productivity and labour shortage in project B, low productivity and poor skills for project C. While weak motivation, labour disputes/ strikes for project D. Here capacity building, training/retraining setting productivity targets/reward are implicated minimization strategies to stem delays.

For External related delays (table 4.8). Principal factors indicted are inclement weather and varied site condition for project A and project B. Slow process of building permit for C and inclement weather and slow building permit for project D. Here speedy approval of building.permits, easement, right of ways and statistical weather analysis and control plan/management for project sites are recommended minimization strategies.

Table 4.9 compared by ranks the importance of top 20 most significant delay factors of the four projects. It identified shortage of material for project A and C, and shortage of manpower for projects B and D. This implicates need for local and backward integrations in the manufacture of input factors and intensification of efforts in construction capacity building.

Table 4.10 gives a comparison of F.I, S.I. and Imp.I of top 20 identified delay factors of the four projects. It portrayed closeness of factors for project A and B, which varied significantly with those of projects C and D, plausibly because of lower number of responses (12 and 10) gained in projects C and D respectively.

Tables 4.11 and 4.12 compared relative importance of the top 15 delay minimization strategies suggested for the projects and implicate accurate initial time estimate for project A, early approval of permits for project B, and utilization of appropriate construction techniques for projects C and D. These results are in line with minimization strategies proffered for related projects by researchers in the reviewed literature.

5.0 CONCLUSION AND RECOMMENDATION

The foregoing analysis concludes that what constitutes principal delay factors varies according to the; characteristics of projects, clients, contractors, consultants and stakeholders involved. The project location, project sponsors and funding protocols utilized among others. So do the impacts of the delay factors.

A number of principal delay factors arising from the study present significant severity effects viz, shortage of manpower and materials, improper planning, financial difficulties of clients and contractors/ delay payments, inclement weather, slow decision making, inadequate contractor experience, inaccurate drawings, inaccurate cost estimate and excessive client change orders.

Minimization strategies and their importance vary and must correlate with causal delay factors and should be projected early in the project plan to achieve maximum results. The study recommends spirited implementation of the following key minimization strategies; provision of adequate sources and size of finance, construction resources, backward integration/local manufacture of input factors, labour motivation, training/retraining, use of competent contractors/consultants and prompt payment of certificates.

Further detail project delay minimization study should be considered, to develop comprehensive minimization templates adaptable to specific projects across the globe as a veritable means of solving the adverse consequences of project delays.

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