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Analysis of Non-Excusable Delay Factors Influencing Contractors' Performance in Lagos State, Nigeria

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Abstract: Delays are one of the biggest problems faced by construction firms. The objectives of this study are to identify non-excusable delay factors, their effects on project completion and means of minimising these delays. A questionnaire survey was conducted to solicit the causes, effects and methods of minimising delays with two groups of respondents: consultants and contractors. Data were collected and analysed using a weighted mean method. A total of 57 major factors that cause non-excusable delays were identified from the reviewed literature and were further classified into eight major groups. The findings of this study revealed 20 key factors that cause non-excusable delays. The resultant effects of non-excusable delays are time overrun, cost overrun and disputes, among others. Ensuring adequate financial sources, engaging competent project managers and making all necessary resources available are some of the most important means of minimising non-excusable delays. Since non-excusable delays are specific to contractors, this study concludes that contractors should review their activities so that construction work will not be delayed.

Keywords: Non-excusable delays, Contractor, Cost overrun, Time overrun

INTRODUCTION

Construction projects are one-off endeavours with many unique features, such as long time spans, complicated processes, extremely challenging environments, financial strain and dynamic organisation structures (Zou, Zhang and Wang, 2007). Delay can be defined as a situation when the contractor and the project owner jointly or severally contribute to the non-completion of the project within the original, stipulated or agreed upon contract period (Aibinu and Jagboro, 2002). Clients or consumers are no longer content with only satisfying minimal cost, adequate functional performance, increasing interest rates, inflation and other commercial pressures, but are also concerned with using the shortest possible amount of time to complete the building project (Nkado, 1995). Ajanlekoko (1987) observed that the construction industry showed poor performance in terms of time. Seven out of 10 projects surveyed in Nigeria suffered delays in their execution (Odeyinka and Yusuf, 1997).

Ozdemir (2010) asserted that the construction industry has a very poor reputation for coping with delays. Delay analysis is generally either ignored or performed subjectively by simply adding a contingency. As a result, many major projects fail to meet scheduled deadlines. In a construction project, in which time truly equals money, the management of time is critical (Duran, 2006), thus predicting a likelihood that schedule delay plays a key role in overall project success (Luu et al., 2009). The foremost concern of every contractor is to ensure that the highest possible performance level is achieved in construction project

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delivery. Although performance is measured against the attainment of the project objective, it is only achievable if the causes and effects of non-excusable delays can be reduced through good practices in mitigating compensable delays. Persistent occurrences of non-excusable delays clearly signal to contractors in the Nigerian construction industry to at least be aware of the common factors contributing to non-excusable delays and then to take measures to prevent that recurrence. Non-excusable delays can be minimised when their causes are identified. Developing countries, such as Saudi Arabia (Assaf, Al-Khalil and Al-Hazmi, 1995), Malaysia (Yong, 1988) and Nigeria (Okpala and Aniekwu, 1988; Elinwa and Buba, 1993; Mansfield, Ugwu and Doran, 1994), suffer construction time and cost overruns. Therefore, the intentions of this paper are to reveal the causes, effects and methods of minimising non-excusable delays in the construction industry in Nigeria – a developing economy with a specific interest in revealing the level of importance of each factor. The study also intends to compare the outcome of the stated intention with previous research.

LITERATURE REVIEW

According to Acharya et al. (2006), delays in construction may be caused by the client, the contractor, the consultants, acts of God, or a third party and they may occur early or late in the job. Whatever the case may be, negotiating a fair and timely damage settlement is beneficial to all parties (Bushbait and Cunningham, 1998). Thus, ascertaining the length of the project delay serves as a basic piece of information for the appointment of responsibility, which may be a highly complex operation in cases with concurrent causes. In this respect, when a delay claim occurs, it is very important to assign responsibility and magnitude and it is often difficult to analyse the ultimate liability in delay claims (Kraiema and Dieknam, 1987).

Construction Delay

There are a number of definitions for "delay": to make something happen later than expected; to cause something to be performed later than planned; or not to act in a timely manner (Mahdavinejad and Molaee, 2011). Each of these definitions can describe a delay in an activity of work in a schedule. On construction projects, as well as on other projects for which a schedule is being used to plan work, it is not uncommon for delays to occur. What is being delayed determines whether a project or some other deadline, such as a milestone, will be completed late. Before any discussion of delay analysis can begin, a clear understanding of the general types of delays is necessary (Trauner, 2009). Delay in project execution is a major problem in the Nigerian construction industry. According to Al-Khalil and Al-Ghafly (1999), delay occurs in both medium and large projects. Virtually all of the projects executed in recent years in Nigeria were faced with the problem of delay in delivery. Odeyinka and Yusuf (1997) observed that seven out of every 10 projects in Nigeria suffer delays.

A construction project is commonly acknowledged as successful when it is completed on time, within budget, in accordance with the specifications and to stakeholders' satisfaction (Majid, 2006). Project success can be defined as meeting

goals and objectives as prescribed in the project plan, while a successful project means that the project has achieved its technical performance, maintained its schedule and remained within budgetary constraints (Frimpong, Oluwoye and Crawford, 2003). The construction industry has a very poor reputation for coping with delays. Delay analysis is either ignored or performed subjectively by simply adding a contingency. As a result, many major projects fail to meet schedule deadlines. In a construction project in which time truly equals money, the management of time is critical (Duran, 2006); thus, predicting the likelihood of schedule delay may play a key role in project success (Luu et al., 2009).

Types of Causes of Delay in Construction Projects

There are two categories of delays used in determining delay damages:

1. Inexcusable delays (non-excusable delays) are caused solely by the contractor or its suppliers (Fugar and Agyakwah-Baah, 2010). The contractor is generally not entitled to relief and must either make up the lost time through acceleration or compensate the owner. This compensation may come from either liquidated damages or actual damages, provided there is no liquidated damages clause in the contract. Liquidated damages are generally expressed as a rate that is based on a forecast of costs the owner is likely to incur in the event of late completion by the contractor (Soon, 2010). These delays might be the results of underestimates of productivity, improper project planning and scheduling, poor site management and supervision, erroneous construction methods, equipment breakdowns, or unreliable subcontractors or suppliers. An example of a non-excusable delay would be when a contractor fails to provide sufficient manpower to complete the job on time (Majid, 2006).

   Non-excusable delays are common in various construction projects and cause considerable losses to project parties. It is widely accepted that construction project scheduling plays a key role in project management due to its significant influence on project success (Luu et al., 2009). The common results of schedule delays include late completion of the project, increased cost, disruption of work, loss of productivity, third party claims, disputes and abandonment or termination of contracts. Therefore, schedule delays in construction projects give rise to dissatisfaction in all the parties involved (Majid, 2006).

2. Excusable delays can be further divided into two categories:

   i. Non-compensable delays are caused by third parties or incidents beyond the control of either the owner or the contractor and are not attributable to any of the parties (Fugar and Agyakwah-Baah, 2010). Examples typically include acts of God, unusual weather, strikes, fires, acts of government in its sovereign capacity, etc. In this case, the

contractor is normally entitled to a time extension but no compensation for delay damages (Soon, 2010).

ii. Compensable delays are caused by the owner or the owner's agents (Fugar and Agyakwah-Baah, 2010). An example of this type of delay would be the late release of drawings from the owner's architect. An excusable, compensable delay usually leads to a schedule extension and exposes the owner to financial damages claimed by the contractor (Soon, 2010). In this case, the contractor incurs additional indirect costs for extended field office and home office overhead and unabsorbed home office overhead.

Studies on Causes of Delay

Mansfield, Ugwu and Doran (1994) identified 16 major factors that cause delays and cost overruns in Nigeria. A questionnaire survey was carried out with contractors, consultants and client organisations in Nigeria. They found that the causes of delay and cost overruns in Nigerian construction projects were attributed to finance and payment arrangements, poor contract management, shortages in materials, inaccurate estimations and overall price fluctuations. Assaf, Al-Khalil and Al-Hazmi (1995) identified 56 main causes of delay in Saudi large building construction projects and established their relative importances. Based on the contractors surveyed, the most important delay factors were preparation and approval of shop drawings, delays in contractor's progress, payment by owners and design changes. From the view of the architects and engineers, cash problems during construction, the relationships between subcontractors and the owner's slow decision-making were the main causes of delay. The owners agreed that design errors, labour shortages and inadequate labour skills were also important delay factors.

Mezher and Tawil (1998) conducted a survey of the causes of delays in the construction industry in Lebanon from the perspective of owners, contractors and architectural/engineering firms. It was found that owners had more concerns regarding financial issues; contractors regarded contractual relationships as the most important; and consultants considered project management issues to be the most important causes of delays. Chan and Kumaraswamy (1996) surveyed the causes of construction delays in Hong Kong as seen by clients, contractors and consultants and examined the factors affecting productivity. The results of their research indicate that the five principal and common causes of delays are poor site management and supervision, unforeseen ground conditions, slow decision making involving all project teams, client-initiated variations and necessary variation of the work. These causes were categorised into the following eight groups:

1. Project-related factors include project characteristics, necessary variations, communication among the various parties, speed of decision making involving all project teams and ground conditions.

2. Client-related factors include those concerned with client characteristics, project financing, their variations and requirements and interim payments to contractors.
3. Design team-related factors include design team experience, project design complexity and mistakes and delays in producing design documents.
4. Contractor-related factors include contractor experience in planning and controlling the project, site management and supervisions, degree of subcontracting and their cash-flow.
5. Materials-related factors include shortages, materials changes, procurement programming and proportion of off-site prefabrication.
6. Labour-related factors include labour shortages, low skill levels, weak motivation and low productivity.
7. Plant/Equipment-related factors include shortages, low efficiencies, breakdowns and incorrect selections.
8. External factors include waiting times for approval of drawings and test samples of materials and environmental concerns and restrictions.

Effects of Non-Excusable Delays

Aibinu and Jagboro (2002) studied the effects of construction delays on project delivery in the Nigerian construction industry. The six identified effects of delay were time overrun, cost overrun, dispute, arbitration, total abandonment and litigation, as shown in Table 1. Through questionnaire evaluation and empirical methods, the effects of construction delays were assessed and the findings showed that time and cost overruns were the most frequent effects of delay.

Table 1. The Effects of Non-Excusable Delays

Effects of Non-Excusable Delays	Rank
Time overrun	1
Cost overrun	2
Dispute	3
Arbitration	4
Litigation	5
Total abandonment	6

Minimising Non-Excusable Delays

Several researchers conducted studies in which they recommended and identified methods of minimising non-excusable delay in construction project. Nguyen, Ogunlana and Lan (2004) studied project success factors in large construction projects in Vietnam. A questionnaire survey was used to collect data from construction practitioners. The following are factors that can be applied as a method of minimising non-excusable delay: competent project manager; multidisciplinary/competent project team; availability of resources; commitment

to projects; frequent progress meetings; accurate initial time estimates; awarding bids to the right/experienced consultant and contractor; proper emphasis on past experience; community involvement; systematic control mechanisms; comprehensive contract documents; effective strategic planning; clear information and communication channels; use of up-to-date technology; and absence of bureaucracy.

Aibinu and Jagboro (2002) identified two methods for minimising or, if possible, eliminating time overruns: acceleration of site activities and contingency allowance. Koushki, Al-Rashid and Kartam (2005) revealed that the minimisation of time delays and cost overrun would require ensuring adequate and available sources of finance until project completion; allocating sufficient time and money at the design phase; selecting a competent consultant and a reliable contractor to carry out the work; performing preconstruction planning of project tasks and resource needs; hiring an independent supervision engineer to monitor the work; and ensuring timely delivery of materials.

Odeh and Battaineh (2002) recommended that improving the situations of construction projects requires enforcing liquidation damage clauses and offering incentives for early completion; developing human resources in the construction industry through proper training and classification of craftsmen; adopting a new approach to contract award procedures by giving less weight to prices and more weight to capacities and past performances of contractors; and adopting new approaches for contracts, such as design-build and construction management-type contracts.

A list of causes of non-excusable delays on construction projects is presented below, as identified from the literature and edited by the authors. These groups were used for this study.

The literature review covered construction delay, types of delay, causes of delay and ways of minimising delay. Findings from the literature formed a strong basis for this particular study.

Table 2. Groups and Factors That Cause Non-Excusable Delays

Groups	**Factors That Cause Non-Excusable Delays**
Material-related delays	1. Shortage of construction materials
	2. Poor quality of construction materials
	3. Poor procurement of construction materials
	4. Imported construction materials
	5. Escalation of material prices
	6. Late delivery of materials
	7. Unreliable suppliers
Labour-related delays	1. Slow mobilisation of labour
	2. Shortage of skilled labour
	3. Labour productivity
	4. Labour supply
	5. Absenteeism
	6. Strike
	7. Low motivation and morale

(*continued on next page*)

Table 2. (*continued*)

Groups	**Factors That Cause Non-Excusable Delays**
Equipment-related delays	1. Insufficient amount of equipment 2. Frequent equipment breakdown 3. Shortage of equipment parts 4. Improper equipment 5. Slow mobilisation of equipment 6. Equipment allocation problems 7. Inadequate modern equipment
Finance-related delays	1. Inadequate fund allocation 2. High interest rates 3. Contractor's financial difficulties 4. Client's financial difficulties 5. Unreasonable constraints from client 6. Delay in payment to suppliers/subcontractors 7. Monthly payment difficulties
Contractor-related delays	1. Inadequate contractor experience 2. Inappropriate construction methods 3. Inaccurate time estimates 4. Inaccurate cost estimates 5. Poor site management and supervision 6. Improper project planning and scheduling 7. Incompetent project teams 8. Unreliable subcontractors 9. Obsolete technology
Client-related delays	1. Slow decision making by client 2. Lack of client experience in construction 3. Change orders 4. Client interference 5. Lack of a capable representative 6. Lack of communication and coordination 7. Improper project feasibility study
Consultant related delays	1. Inadequate consultant experience 2. Poor design and delays in design 3. Inadequate project management assistance 4. Slow responses and poor inspections 5. Incomplete drawing/detail design 6. Inaccurate site investigation

(*continued on next page*)

Table 2. (*continued*)

Groups	Factors That Cause Non-Excusable Delays
External related delays	1. Unforeseen ground conditions
	2. Unexpected geological conditions
	3. Inflation/Price fluctuations
	4. Slow site clearance
	5. Problems with neighbours
	6. Weather conditions
	7. Conflict, war and public enemies

Sources: Assaf et al. (1995); Chan and Kumaraswamy (1996); Ogunlana, Promkuntong and Jearkjirm (1996); Abd Majid and McCaffer (1998); Odeh and Battaineh (2002); Frimpong, Oluwoye and Crawford (2003); Koushki, Al-Rashid and Kartam (2005)

METHODOLOGY

A questionnaire survey was developed to assess the perceptions of contractors and consultants regarding the relative importance of the causes and effects of non-excusable delays. The questionnaire was designed based on the factors identified that contribute to non-excusable delays, the effects of non-excusable delays and the methods used to minimise non-excusable delays. The questionnaire approach was adopted because the study intends to capture the perceptions of various stakeholders in consulting and contracting organisations and because all factors needed to be assessed based on the same parameters that can be numerically measured.

Due to the constraints of visiting every construction firm in Lagos State, a total of 10 construction firms and 10 consulting firms were selected. The selected firms have records of experiencing non-excusable delays at some point in the past. Professionals in the construction industry were identified as respondents in the research; therefore, the research population comprised contractors, architects, civil engineers, builders and quantity surveyors from the organisations selected for the study. The sampling method adopted for this research work is the convenience sampling method.

Sixty copies of the questionnaire were administered to a random sample of 30 contractors and 30 consultants to assess their perceptions of the relative importance of the causes and effects of non-excusable delays, as well as ways of minimising such delays. The questionnaire was designed based on the factors identified from the literature review that contribute to non-excusable delays, the effects of non-excusable delays and the methods to minimise non-excusable delays.

Questionnaire Design and Method of Data Analysis

The questionnaire was divided into four parts. The first part requested background information about the respondents. The second part of the questionnaire focused on causes of non-excusable delay. The respondents were asked to indicate their responses to 57 well-recognised non-excusable delay factors. These causes were categorised into the following eight major groups, as identified by Sambasivan

and Soon (2007): material-related, labour-related, equipment-related, finance-related, contractor-related, client-related, consultant-related and external factors. The third part of the questionnaire focused on the effects of non-excusable delays in the construction industry. The six effects of non-excusable delay identified were time overruns, cost overruns, disputes, arbitration, litigation and abandonment. The fourth part was similar to the second part of the questionnaire and the respondents were asked to indicate their recommendation for minimising the effects of non-excusable delays through an open-ended question. A five-point Likert scale ranging from 1 (not important) to 5 (extremely important) was adopted to capture the importance of the causes and effects of delays, while 1 (not effective) to 5 (very effective) was used for the methods of minimising non-excusable delays. The transformed mean score for each factor was calculated as follows:

$$MS = \frac{\sum Wi\ Xi}{\sum Xi}$$

where
Wi = the weight assigned to the *i*th response = 1, 2, 3, 4, 5;
Xi = the frequency of the *i*th response given as a percentage of the total responses for each factor.

DATA ANALYSIS

Twenty-five consultants and 28 contractors completed and returned the questionnaire, as shown in Table 3.

As shown in Table 4, contractor-related delays have the highest ranking in the causes of non-excusable delays, followed by equipment-related delays, client-related delays, material-related delays, external related delays, finance-related delays, consultant-related delays and labour-related delays.

Table 3. Questionnaire Distribution and Responses

Respondent	Total Administered	Total Collected	Rate of Return
Contractors	30	28	52.83%
Consultants	30	25	47.17%
Total	60	53	100%

Contractor-related delays

Both consultants and contractors ranked this group of causes very highly. From a total of nine identified factors of contractor-related delays, seven of these factors fall within the top 20 most important causes of non-excusable delays (Table 5). Consultants and contractors are mainly concerned with technical and management factors, such as inaccurate time estimates, inaccurate cost estimates, poor site management and supervision, improper project planning and

scheduling, incompetent project teams, lack of competent subcontractors and inappropriate construction methods. It should be noted that the contractor is also liable for other groups of causes of non-excusable delays and not just this group named "contractor-related".

Table 4. Ranking of Major Non-Excusable Delay Groups

Methods	Consultant		Contractor		Overall	
	MS	Rank	MS	Rank	MS	Rank
Contractor	3.73	1	3.65	1	3.69	1
Equipment	3.52	2	3.50	2	3.51	2
Client	3.52	2	3.44	3	3.48	3
Material	3.37	4	3.43	6	3.40	4
Finance	3.30	6	3.44	3	3.37	5
Consultant	3.28	7	3.44	3	3.36	6
External	3.32	5	3.35	8	3.34	7
Labour	3.26	8	3.36	7	3.31	8

Equipment-related delays

Groups of equipment-related causes were ranked second by both consultants and contractors, as shown in Table 4. According to Table 5, there are three factors of equipment-related delays included in the top 20 most important factors causing non-excusable delays. Insufficient numbers of equipment was ranked among the top 20 factors by both consultants and contractors. Inadequate modern equipment was ranked seventh and frequent equipment breakdown ranked 13th. Equipment allocation problems, frequent equipment breakdown and shortage of equipment parts are related to the factor of an insufficient amount of equipment. Inadequate modern equipment was ranked seventh among the top 10 factors. This finding is particularly true for older model equipment, which is related to low production and frequent equipment breakdowns.

Client-related delays

The client-related delay factors were the third most important group for both consultants and contractors, as shown in Table 4. This ranking is mainly due to change orders, which both parties considered very important. Three of the seven factors of client-related delays are among the top 20 most important causes of non-excusable delays (Table 5). Change orders were ranked fourth, slow decision making by the client was ranked 19th and lack of communication and coordination between parties ranked twentieth. It was interesting to discover that slow decision-making by the client is of importance to both parties. This observation is particularly true in certain cases in which the client has no priority/urgency to complete the project. Change orders were ranked fourth among the top five factors by both consultants and contractors. Change orders in construction projects can occur for both construction and administrative needs. In

the construction needs, there are four types of causes, namely, planning and design, underground conditions, safety considerations and natural incidents. In the administration needs, another five types can be distinguished, including changes in rules/regulations, changes of decision-making authority, special needs for project commissioning, ownership transfer and neighbourhood pleading.

Material-related delays

Referring to Table 4, material-related delays were ranked fourth by consultants and sixth by contractors. As shown in Table 5, there are two material-related delay factors among the top 20 most important factors that cause non-excusable delays. Shortage of construction material was ranked eighth and late delivery of materials ranked 14th. Shortage of construction materials on the construction site, poor site management and supervision, poor procurement programming of materials, contractor's financial difficulties, shortage of construction material from the material production or material distribution centre, escalation of material prices and inflation/price fluctuations are the material-related delay factors ranked by the respondents.

Finance-related delays

This group of causes was ranked low, sixth by contractors and third by consultants, as shown in Table 4. Referring to Table 5, difficulty in making monthly payments was ranked third among the top 20 factors by both consultants and contractors. This problem may be due to the existing culture in the construction industry. In most developing countries such as Nigeria, in most public work projects, including any construction project under the government's authority, there are always delays in payment for completed work due to bureaucracy in government departments. Regular monthly payments to contractors for work performed may remove constraints that could otherwise impede project progress, causing non-excusable delays. The other finance-related factor was the contractor's financial difficulties, which was ranked ninth by consultants and ranked twelfth by contractors. This factor was related to funding shortages, high interest rates and the contractor's cash flow during construction.

Consultant-related delays

As shown in Table 4, neither contractors nor consultants ranked this group of factors high among the major groups of factors causing delays. Referring to Table 5, out of six factors of consultant-related delays (inadequate consultant experience, poor design and delays in design, inadequate project management assistance, slow response and poor inspection, incomplete drawing/detail design and inaccurate site investigation), only poor design or delay in design was ranked 16th, with a mean score of 3.60, out of the top 20 most important factors that contribute to the causes of non-excusable delays.

External factor-related delays

This group of causes was ranked low, eighth by contractors and fifth by consultants, as shown in Table 4. In Table 5, slow site clearance was ranked 17th among the top 20 most important factors that contributed to the causes of non-excusable delays in construction projects. This observation is particularly true for the acceleration of site activities. Project site clearance usually faces many conflicts, including internal and interface conflicts, between project teams and communities. This conflict is a major cause of interruption in civil engineering projects. Comprehensive project feasibility studies and accurate site investigations have visible and substantial benefits. Therefore, it is recommended that the project site should be well prepared before commencing construction or mobilising facilities and equipment. The people affected near the project site should be well informed about projects and satisfactory compensation should be offered to take ownership of their properties. Environmental and social impact assessments should be appropriately carried out when necessary. These precautions will ensure that projects run smoothly and without interruption during the construction phases.

Labour-related delays

Although there are three factors of labour-related delays among the top 20 most important factors contributing to the causes of non-excusable delays, as shown in Table 5, this group of causes received very low ranking by both consultants and contractors. This group seems to be more important to contractors than to consultants. Generally, labour problems are related to labour supply/slow mobilisation of labour, low productivity, lack of skill, low motivation, low morale, absenteeism and lack of commitment to the project.

Most Important Factors that Cause Non-Excusable Delays

Based on the above discussion, a total of 57 factors that contributed to the causes of non-excusable delays in construction projects were identified, ranked and analysed. To identify the most important factors that contribute to the causes of non-excusable delays, an analysis was conducted to determine the top 20 factors of the overall ranking factors that cause non-excusable delays, as shown below.

Table 5 shows the 20 most important factors that cause non-excusable delays, where an insufficient amount of equipment ranked highest with an overall mean score of 4.03, followed by inaccurate time estimates, monthly payment difficulties, change orders and inaccurate cost estimates. Moreover, poor site management and supervision, inadequate modern equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling and contractor's financial difficulties are among the top 10 factors as ranked by both groups. Among the top 10 factors that cause non-excusable delays, there are five factors of contractor-related delays, two factors of equipment-related delays, two factors of finance-related delays, one factor of client-related delays and one factor of material-related delays. This analysis shows that 50% of the most important factors are contractor-related delays.

According to the types of delays, from the top 11 factors that cause non-excusable delays as shown in Table 5, there are nine factors that fall under the

heading of non-excusable delays, i.e., insufficient amount of equipment, inaccurate time estimates, inaccurate cost estimates, poor site management and supervision, inadequate modern equipment, shortage of construction materials, incompetent project team, improper project planning and scheduling and contractor's financial difficulties. Two factors fall under the category of excusable delays with compensation, i.e., change orders and monthly payment difficulties. Therefore, it can be concluded that 80% of construction delays are caused by the contractor and 20% are caused by the consultant and the client.

Table 5. Ranking of the Top 20 Most Important Factors That Cause Non-Excusable Delays

Factors	Consultant		Contractor		Overall	
	MS	Rank	MS	Rank	MS	Rank
Insufficient amount of equipment	4.06	2	4.00	1	4.03	1
Inaccurate time estimates	4.08	1	3.96	2	4.02	2
Monthly payment difficulties	4.03	3	3.89	4	3.96	3
Change orders	3.99	4	3.91	3	3.95	4
Inaccurate cost estimates	3.95	5	3.87	5	3.91	5
Poor site management and supervision	3.90	7	3.82	7	3.86	6
Inadequate modern equipment	3.93	6	3.76	8	3.85	7
Shortage of construction materials	3.80	12	3.84	6	3.82	8
Incompetent project team	3.88	8	3.76	8	3.83	9
Improper planning and scheduling	3.84	10	3.74	9	3.79	10

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Table 5. (*continued*)

Factors	Consultant		Contractor		Overall	
	MS	Rank	MS	Rank	MS	Rank
Contractor's financial difficulties	3.86	9	3.64	12	3.75	11
Unreliable subcontractors	3.77	13	3.71	10	3.74	12
Labour productivity	3.61	19	3.60	14	3.61	15
Frequent equipment breakdown	3.73	14	3.53	17	3.63	13
Late delivery of material	3.69	15	3.56	16	3.62	14
Shortage of skilled labour	3.64	17	3.58	15	3.61	15
Poor design/delays in design	3.58	21	3.62	13	3.60	16
Slow site clearance	3.67	16	3.51	18	3.59	17
Labour supply	3.60	20	3.49	19	3.55	18
Slow decision making by client	3.56	22	3.47	20	3.52	19
Lack of communication and coordination	3.62	18	3.40	21	3.51	20

Common Effects of Non-Excusable Delays

To determine the effects of non-excusable delays on construction projects, six factors were identified and ranked based on the mean values, which are calculated as the average indices of factors between contractors and consultants, as shown in Table 6. Time overrun and cost overrun were the two most common effects of delays in construction projects from the points of view of contractors and consultants.

According to the top 10 factors that contribute to the causes of non-excusable delays, there are at least five factors that have major influences on time overruns in a construction project, i.e., change orders, monthly payment difficulties, insufficient amount of equipment, shortage of construction material and construction financial difficulties and at least five factors related to cost overruns in a construction project, i.e., inaccurate cost estimates, inaccurate time estimates, poor site management, incompetent project team and improper project planning and scheduling.

As shown in Table 6, dispute was ranked third. This observation is particularly true because the three factors that cause non-excusable delays that were discussed earlier as having major influences on causes of dispute, i.e., poor design/delays in design, incomplete drawings/detail design and unforeseen ground conditions, are not the most important factors that contribute to causes of delays. One of the key factors in avoiding disputes and claims is to ensure completion of the design in all respects before the start of construction. Another factor that can reduce claims and disputes is adequate and properly conducted site investigations. Unforeseen ground conditions that are revealed at a late stage can be disastrous to the overall project aims and objectives. The following are among the methods of dispute resolution in the construction industry: arbitration, litigation and Alternative Dispute Resolution (ADR). ADR is a voluntary process in which the parties are assisted in solving their disputes by a neutral third party without the need of a judge or arbitrator. ADR techniques are (1) mediation, (2) conciliation, (3) adjudication and (4) executive tribunal. ADR procedures, unlike litigation and arbitration, are not binding until a mutually agreed settlement is reached and put in writing, that is to say, either party can resort to other methods of dispute resolution if the ADR procedure fails.

Table 6. Ranking the Common Effects of Non-Excusable Delays

Effects of Delays	Consultant	Contractor	Overall	
	Mean Score	Mean Score	Mean Score	Rank
Time overrun	3.47	3.31	3.39	1
Cost overrun	2.34	2.56	2.45	2
Dispute	1.88	1.19	1.54	3
Total abandonment	1.78	1.20	1.49	4
Arbitration	1.04	1.03	1.04	5
Litigation	1.02	1.01	1.02	6

Effective Methods of Minimising Non-Excusable Delays

Table 7 shows the ranking of the top fifteen effective methods of minimising construction delays from the viewpoints of contractors and consultants. These methods were ranked based on the mean values calculated as the average mean scores of the methods identified by contractors and consultants.

The results of the research reveal that ensuring adequate and available sources of financing, a competent project manager, availability of resources, frequent progress meetings and awarding bids to the right/experienced consultants and contractors are the top five effective methods according to both consultants and contractors. These methods emphasise that successful projects were implemented with ease, that is, financing, resources, effort and leadership should be available at all times throughout the project's life to ensure that construction projects run smoothly.

Finances, other resources of adequate and available sources of financing and availability of resources are obvious imperatives for carrying out projects and ensuring project completion. Effort in terms of continuing involvement of all stakeholders and comprehensive contract documentation is needed to ensure the existence of general agreements and the collective genius of the professionals in the relevant organisations, as well as proper project control. Leadership is a crucial aspect of project management. There are three different types of competencies required in leadership: leadership competencies such as the ability to lead change, functional competencies such as technical and human resources management skills and personal skills such as high achievement motivation and persistence. Therefore, a competent project manager possesses not only technical and managerial skills but also good leadership skills in doing "the right thing right" and searching for suitable and intangible assets in today's knowledge-based economy.

Table 7. Ranking of the Top 15 Effective Methods of Minimising Non-Excusable Delays

Methods	Consultant	Contractor	Overall	
	MS	MS	MS	Rank
Ensuring adequate and available sources of finance	4.07	4.08	4.08	1
Competent project manager	4.11	3.99	4.05	2
Availability of resources	4.05	3.97	4.01	3
Frequent progress meetings	4.00	3.94	3.97	4
Awarding bids to the right/experienced consultant and contractor	4.03	3.92	3.98	5
Use of experienced subcontractors and suppliers	3.98	3.90	3.94	6
Multidisciplinary/competent project team	3.92	3.81	3.87	7
Accurate initial cost estimates	3.77	3.88	3.83	8
Competent and capable client representatives	3.81	3.83	3.82	9

(*continued on next page*)

Table 7. (*continued*)

Methods	Consultant	Contractor	Overall	
	MS	MS	MS	Rank
Use of appropriate construction methods	3.85	3.77	3.81	10
Performing preconstruction planning of project tasks and resource needs	3.87	3.72	3.80	11
Project management assistance	3.79	3.79	3.79	12
Adopting new approaches to contracting such as Design-Build and Construction Management (CM) types of contracts	3.90	3.61	3.76	13
Acceleration of site clearance	3.61	3.86	3.74	14
Allocation of sufficient time and money at the design phase	3.83	3.59	3.71	15

DISCUSSION OF FINDINGS

This paper classifies the main causes of non-excusable delays according to the sources of occurrence, identifies the major factors contributing to those causes and then reveals appropriate means of minimising these delays. The major delay groups were identified and ranked and contractor-related delays ranked highest among the main groups. This result is in agreement with Sambasivan and Soon (2007). From a total of 57 factors that cause non-excusable delays, the top 20 most important factors were identified. The top five most important factors that contribute to the causes of non-excusable delays are insufficient amount of equipment, inaccurate time estimates, monthly payment difficulties, change orders and inaccurate cost estimates. Chan and Kumaraswamy (1996) surveyed the causes of construction delays in Hong Kong as seen by clients, contractors and consultants. The results of their research indicated that the five principal and common causes of delays are poor site management and supervision, unforeseen ground conditions, low speed of decision making involving all of the project team, client initiated variations and necessary variation of the work. It should be noted that poor site management is a contractor-related delay. This fact implies that contractor-related delays require adequate attention because this delay type topped the principal causes of delay as far back as 1996 and is still a very significant problem, as revealed by this study. The effects of non-excusable delays have also been identified. Time overruns and cost overruns were the most common effects of non-excusable delays in construction projects, which is in line with the Aibinu and Jagboro (2002) study on the effects of construction delays on project delivery in the Nigerian construction industry. To minimise non-excusable delays in construction projects, the top fifteen most effective methods of minimising non-excusable delays have been identified from a total of thirty-five methods. The top five methods are ensuring adequate and available sources of financing, use of a competent project manager, availability of resources, frequent

progress meetings and awarding bids to the right/experiences consultant and contractor. Four of these five methods were among the first seven methods of minimising non-excusable delays as recommended by Nguyen, Ogunlana and Lan (2004) in a study conducted on projects in Vietnam. Koushki, Al-Rashid and Kartam (2005) recommended adequate and available sources of financing until project completion. Although the study was not specific with respect to the type of delay, excusable or non-excusable, this study aligns with the outcome of their study in respect to the high importance of providing adequate financing through the duration of a project.

CONCLUSIONS

The construction industry has a poor record for coping with delays (Ajanlekoko, 1987; Nkado 1995; Odeyinka and Yusuf, 1997; Aibinu and Jagboro, 2002; Ozdemir, 2010). This particular study focused on non-excusable delays with a specific interest in a developing economy, Lagos State in Nigeria. The outcome of this study confirms the existence of non-excusable delays in the study region. A total of eight non-excusable delay groups were identified and it is worthy to note that each of these groups had a mean score of 3.30 or above. Additionally, all 20 of the most important non-excusable delay factors identified in this work had mean scores above 3.50. It can therefore be said that a high importance was attached to each of the factors identified; therefore, non-excusable delay is one of the major issues that needs urgent attention in the Nigerian construction industry.

Whenever a delay does occur, its implications to the future performance of the project can be immediately determined and corrective action can be taken to minimise any negative impacts on project performance. The contractor is expected to have control over the non-excusable delays and, presumably, to do more to prevent them. Understanding the underlying factors that contribute to causes of non-excusable delays would help identify and overcome the problems faced by contractors during the construction process. Although several factors contribute to project delays, the significance of non-excusable delay factors that are simply the contractor's contribution is evident in this research. It can be seen that all mean scores of the identified factors were above 3.00.

This study therefore recommends the strict application of effective methods of minimising non-excusable delays, as outlined in an earlier section of this work.

RECOMMENDATIONS FOR FUTURE RESEARCH

Based on the limitation of not being able to sample more than 10 contractors and 10 consultants, future research should engage a larger number of respondents. Additionally, in addition to quantitative measurements, a qualitative study of the causes, effects and methods of minimising non-excusable delay factors should be performed.

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