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Stakeholders' Perception of the Causes and Effect of Construction Delays on Project Delivery

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ABSTRACT: *Indian Construction industry is large, volatile, and requires tremendous capital outlays. Typically, the work offers low rates of return in relation to the amount of risk involved. A unique element of risk in the industry is the manner in which disputes and claims are woven through the fibre of the construction process. Delay is generally acknowledged as the most common, costly, complex and risky problem encountered in construction projects. Because of the overriding importance of time for both the Owner and the Contractor, it is the source of frequent disputes and claims leading to lawsuits. The growing rate of delays is adversely affecting the timely delivery of construction projects. Presently construction industries are facing a lot of problems, considering that a paper assess construction stakeholder's perception to the causes of delays and its effects on project delivery. And also one case study is considered in this paper to elicit responses from construction stakeholders. The primary aim of this paper is to identify the perceptions of the different parties regarding causes of delays, the allocation of responsibilities and the types of delays, and method of minimizing the construction delays.*

Keywords: *Delay, Project Delivery, Stake Holders, Cost overrun.*

I. Introduction

The problem of delays in the construction industry is a global phenomenon, Delays and disruptions are the challenges faced in the course of executing construction projects. The purpose of this paper is to assess causes and effects and disruptions in construction projects. The growing rate of delays is adversely affecting the timely delivery of construction projects. This paper therefore assesses stakeholders' perception of the causes of delays and its effects on project delivery in a bid to proper solution in minimizing the occurrences of delays. Questionnaire survey was conducted to elicit responses from stakeholders, On the other hand, time overrun, cost overrun, negative social impact, accumulation of interest rates, idling resources and disputes are the main effects of delays and disruptions. The study concludes that there still exist a number of causes of delays and disruptions and their effects put construction projects at great risk that have an effect on their performance.

Now a day's construction industries are facing the problem of Delays and Disruptions while executing the construction project

II. Delay

In construction, the word "delay'' refers to something happening at a later time than planned, beyond the date that the parties agreed upon for the delivery of a project. Delay is defined as the slowing down of work without stopping construction entirely and that can lead to time overrun beyond the date that the parties have agreed upon for the delivery of the project. Delays are classified into non-excusable delays, excusable non-compensable delays, excusable compensable delays and concurrent delays

Tables, figures, mathematics, acknowledgements, appendixes, notations are optional contents for papers. When the figures and tables are added, all contents need to be numbered correctly.

Types of Delay

Delays can be grouped in the following four broad categories according to how they operate contractually:

I. Non-excusable delays
II. Excusable non-compensable delays
III. Excusable compensable delays
IV. Concurrent delays

Non-excusable Delays

Non-excusable delays are delays, when the contractor is responsible for the cause of the Delay; these delays might be the results of underestimates of productivity, inadequate Scheduling or mismanagement,

construction mistakes, weather, equipment breakdowns, Staffing problems. The contractor cannot obtain a time extension for non-excusable delays. The contractor is also liable for damages incurred by the owner as a result of the non-excusable delay. These delays are within the control of the Contractor.

Non-compensable Excusable Delays:

When a delay is caused by factors that are beyond the Contractor's control and not attributable to the Contractor's fault, it called as "Excusable delay". This term has the implied meaning that neither party is at fault under the Terms of the contract and has agreed to share the risk and consequences when excusable events occur. The Contractor will not receive compensation for the cost of delay, but he will be entitled for an additional time to complete his work and is relieved from any contractually imposed liquidated damages for the period of delay.

Concurrent Delays

Concurrent delays occur when both Owner and the Contractor are responsible for the delay. Generally, if neither the Contractor can be held responsible for the delay (forced to accelerate, or be liable for liquidated damages) nor can he recover the delay damages from the Owner. Until the development of CPM schedule analysis, there was no reliable method to differentiate the impact of Contractor caused delays from Owner-caused delays. With the sophisticated computerized techniques now available, however, it has become possible to segregate the impacts of apparently concurrent Owner and Contractor delays.

***Causes of delays*:**

One of the most important problems in the Construction industry is delay. Delays occur in every construction project and the magnitude of these delays varies considerably from project to project. Some projects are only a few days behind the schedule; some are delayed over a year. So it is essential to define the actual causes of delay in order to minimize and avoid the delays in any construction project. There is a wide range of views for the causes of time delays for engineering and construction projects. The successful execution of construction projects and keeping them within estimated cost and prescribed schedules depend on a methodology that requires sound engineering judgment. Delays can be minimized only when their causes are identified. Knowing the cause of any particular delay in a construction project would help avoiding the same.

There are two kinds of causes for delays in construction projects: external and internal causes. Internal causes of delays include the causes, which come from four parties involved in that project. These parties include the Owner, Designers, Contractors, and Consultants. Other delays, which do not come from these four parties, are based on external causes for instance from the government, material suppliers, or weather.

In this step, all the causes for delays that may be encountered in a construction project were identified and the causes of delays are classified into six broad categories depending on their nature and mode of occurrence. Based on the findings, the delays checklist is as follows:

TABLE I

DELAYS CHECKLIST

Sr. No.	Causes	Sub Causes
a	Acts of god	*Flood* *Hurricane* *Fire* *Wind Damage*
b	Design – related	*design development* *change order* *decision during development stage* *changes in drawings*
c	Construction-related	*inspections* *subsurface soil conditions* *material procurement* *poor subcontractor performance* *equipment availability*
d	Financial/economical	*financial process* *financial difficulties* *delayed payments* *economic problems*
e	Management/administrative	*labour dispute and strike* *inadequate planning* *inadequate scheduling*

		staffing problems
f	Code-related	*building permits approval process* *changes in laws and regulations* *safety rules*

Effects of delay:

Construction delays occur either as a liability on part of the client and his team, liability on part of the contractor and his team, social political issues through the changes bye-laws, statues etc. The effects of these delays is always debilitating on construction project performance. Studies conducted on the effect of delay on project delivery have revealed that delays are associated with time and cost overruns as well as litigation and project abandonment.

The followings are some of the possible effects of delays that the construction industry is facing now a days are:

Extension of time on the project
Cost overruns due to inflation and fluctuations
Accumulations of interest rate on the capital to finance the project
Wastage and under-utilization of man-power resources
Claims on the disturbance of regular progress of work by the main contractor
Under-utilization of equipment and plant purchased for the project
Loss of confidence on the contract, thereby jeopardizing the reputation of the contractor in the case of future tendering chances
Late returns of income (Private developers)
Dispute between the parties involved.
Additional insurance charges
Extra taxes and dues due to delay
In solvency of the contractor.
Arbitration/ Litigation
Total Abandonment of project

Method to minimize delays and its effects:

A. Research Design

This survey was carried out base on the review of relevant literatures and questionnaire surveys. Data used for the survey were primary and secondary. The primary data are the responses of the three main classifications of construction stakeholders of clients, consultants and contractors. Information regarding causes and effects of delays were extracted from above study and domesticated to the study population.

Data for this research were primarily gathered through a structured questionnaire. The questionnaire was designed with three major parts; the first part seeks for the general information about the respondents. The second part obtains the information on factors that contribute to the causes of delay in construction projects while in the final part, respondents were asked to rank the individual causes of delay in construction project based on frequency of occurrence according to their own judgment and working experience as clients' contractors or consultants.

B. Population and Sample

The population of the research was drawn from the practitioners of the construction industry where High concentration of construction works is prevalent in this areas, Judgmental sampling technique was adopted in chosen respondents; construction clients, consultants and contractors were identified to provide their perceptions and opinions on the causes and effects of delays on project delivery based on their experience.

C .Characteristics of Respondents

Following Table presents the characteristics of respondents with respect to their organization types. From the table, 16% of the respondents are professionals that work in clients' organization, while 39% and 45% represent respondents working in contracting and consulting organizations respectively.

TABLE II

CHARACTERISTICS OF RESPONDENTS

Type of Organization	**No.**	**Percent (%)**
Client Organization	6	16

Contracting Organization	15	39
Consulting Organization	17	45
Total	30	100

III. Case Study

The preliminary data for this Case study was collected through a literature review and the use of a questionnaire survey targeted at Contractors in the State of Florida.

Detailed Literature Review
I
Questionnaire Survey
I
Florida's construction
Contractors
I
Analysis
I
Conclusions &
Recommendations

In this step, all the causes for delays that may be encountered in a construction project were identified through a detailed review of published technical papers, recent magazines, newspapers and via Internet. The causes of delays are classified into six broad categories depending on their nature and mode of occurrence, as early seen in the delays checklist.

Questionnaire:
The questionnaire survey was developed to identify:

- The type of delay:

A=Non-Excusable
B=Excusable Non-Compensable
C=Excusable Compensable
D=Concurrent

- . Chance of occurrence:

1-Unlikely = 20 % probability to happen.
2-As likely as not = 40 %
3-Likely = 60 %
4-Almost certain = 80 %
5-Certain = 100 % probability to happen

- . *Responsibility*

Own=Owner
Cont=Contractor
Cons=Consultant
Gov=Government
Shared=Shared

Results of Case Study
This deals with the analysis of the information gathered
from the questionnaire survey and includes the identification of the critical causes of delays, responsibilities and types of delays based on the delays checklist outlined in the methodology section of the report.

Questionnaire Response Rate:
A detailed questionnaire was prepared and sent to the different companies specially General Contractors in the State of Florida by regular mail and also via Internet. The survey was carried out over the period from October 2001 to March 2002, and the response rate is as shown in the Table III:

TABLE III

RESPONSE RATE

Questionnaire Sent	**Regular Mail**	**Via Internet**	**Total**
No. of Participant	200	180	380
No. of Companies Responding	23	12	35
Response Rate	11.5%	6.67%	9.21%

Identification of the Key Delays:

The key causes of delays are presented in tables IV – IX Each table categorizes the different causes of delays (Acts of God, Design-Related Delays, Construction-Related Delays, Financial/Economical Delays, Management/Administrative Delays and Code-Related Delays) based on the chance of occurrence. The chance of occurrence was rated on a scale of 1 to 5 with 1 having the lowest frequency of occurrence and 5 is the highest. The number in the filled cells indicates the number of respondents who chose that option. The last cell in each category shows the average of the responses while the far most right column indicates the selection of the key causes of delays, which were selected as those having a value of 2.5 or higher indication at least a 50% chance of occurrence

TABLE IV
KEY DELAYS – ACTS OF GOD

Acts of God	**1**	**2**	**3**	**4**	**5**	**Avrg. of Responses**	**Key Delay**
Flood	20	4	3	0	0	*1.37*	
Hurricane	5	10	9	1	0	*2.24*	
Fire	11	11	3	0	0	*1.68*	
Wind Damage	7	11	7	0	0	*2.00*	
Total of Key Delay							**0**

TABLE V
KEY DELAYS – DESIGN RELATED

Design-Related	**1**	**2**	**3**	**4**	**5**	**Avrg.of Responses**	**Key Delay**
Change Order	0	3	5	12	6	***3.81***	✓
Decision in development stage	0	5	11	6	4	***3.35***	✓
Changes in Drawings	0	3	6	10	6	***3.76***	✓
Changes in Specifications	2	4	8	8	5	***3.37***	✓
Shop Drawings Approval	0	5	10	4	3	***3.23***	✓
Incomplete Documents	0	4	8	5	7	***3.63***	✓
Design Development	1	4	12	7	2	***3.19***	✓
Total of Key Delay							7

TABLE VI
KEY DELAYS – FINANCIAL/ECONOMICAL

Financial/Economical	**1**	**2**	**3**	**4**	**5**	**Avrg.of Responses**	**Key Delay**
Financial Process	4	10	8	2	0	*2.33*	
Financial Difficulties	5	10	8	1	0	*2.21*	
Delayed Payments	2	8	8	5	0	***2.70***	✓
Economic Problems	4	11	7	2	0	*2.29*	
Total of Key Delay							1

TABLE VII
KEY DELAYS – CONSTRUCTION RELATED

Construction Related	**1**	**2**	**3**	**4**	**5**	**Avrg.of Responses**	**Key Delay**
Lack of Inspections	0	4	12	4	5	***3.40***	✓
Subsurface Soil Conditions	4	10	10	3	0	*2.44*	
Material/Fabrication Delays	1	7	14	3	2	***2.93***	✓
Material Procurement	1	13	6	5	1	***2.69***	✓
Lack of Qualified Craftsmen	4	8	9	3	2	***2.65***	✓
Poor Subcontractor Performance	2	9	8	5	2	***2.85***	✓
Construction Mistakes	5	9	6	2	3	***2.56***	✓
Total of Key Delay							6

TABLE VIII
KEY DELAYS – MANAGEMENT AND ADMINISTRATIVE

Management and Administrative	**1**	**2**	**3**	**4**	**5**	**Avrg.of Responses**	**Key Delay**
Labor Dispute and Strike	12	4	6	1	0	*1.74*	
Inadequate Planning	5	9	7	3	0	*2.33*	
Inadequate Scheduling	4	9	7	2	0	*2.32*	
Contract Modifications	2	7	5	2	1	***2.91***	✓
Staffing Problems	4	10	7	2	0	*2.30*	
Lack of coordination On-site	5	9	8	1	0	*2.22*	
Transportation Delays	3	11	7	1	0	*2.27*	
Total of Key Delay							1

TABLE IX
KEY DELAYS - CODE RELATED

Code Related	**1**	**2**	**3**	**4**	**5**	**Avrg. of Responses**	**Key Delay**
Building Permits Approval Process	1	2	6	5	9	**3.83**	✓
Changes in Laws and Regulations	1	7	8	4	3	**3.04**	✓
Safety Rules	3	8	9	0	2	**2.65**	✓
Florida Building Code	1	7	9	3	3	**3.00**	✓
Building Regulations in Coastal Regions	0	10	9	1	3	**2.87**	✓
Coastal Construction Control Line Permit	3	4	9	3	3	**2.95**	✓
Florida Administrative Code	4	6	6	4	2	**2.73**	✓
National Flood Insurance program	5	7	5	3	2	**2.55**	✓

OSHA Regulations	2	11	5	3	2	**2.65**	✓
Total of Key Delay							**9**

After analysing tables IV through IX, based on their chance of occurrence the main key delays ranked from the highest to the lowest in each category affecting the Florida Construction Industry are shown in highlighting.
Figures II through VII are briefly explained below:

Basic structure of the flow diagram as it relates to delays:

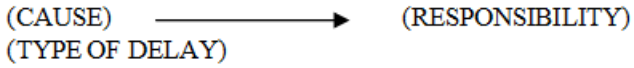

Figure I
Basic Structure Of Delay Showing Causes And Responsibilities

***Acts of God*:**

There is no key delay in this category. The most likely to happen is a hurricane with a 44.8% (2.24 from table IV) chance of occurrence which is less than 50% to be considered as a key delay. In the event a delay occurs due to Acts of God, the responsibility is borne by the Owner and the type of delay is an excusable compensable

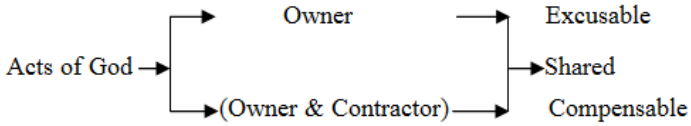

Figure II. Acts Of God

Design Related:

This is one of the most critical categories among the six because all of the causes were identified as key delays, which means that a delay is most likely to happen due to a design related problem. In fact there is a 76.2% chance (3.81 from table V) that a delay occurs due to a change order, which is very high in number. According to the survey, Design-Related Delays are considered as excusable compensable delays.

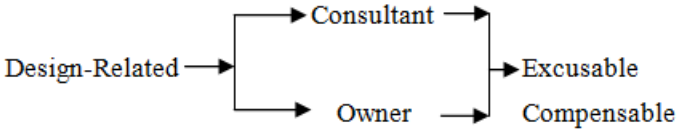

Figure III. Design Related

Construction Related:

Basically in construction stage, the contractor will always have the responsibility and the construction company will get no time or money if a delay occurs. However, if a delay occurs because of Subsurface Soil Conditions or Different Site Conditions, the responsibility would be shared between the contractor and the owner and the type of delay in this situation would be considered excusable compensable. Delays due to lack of inspections with 68% (3.40 from table VII) are the most common in this stage

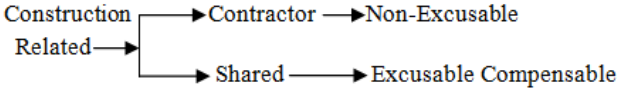

Figure IV. Construction Related

Financial/Economical:

A delayed payment (2.70) was selected as the only Key Delay. According to the results, it seems that delays rarely occur because of Financial/Economical reasons. The owner of the project will always have the responsibility, which means that the delay will be excusable compensable.

Financial and Economical → Owner → Excusable Compensable

Figure V. Financial and Economical

Management/Administrative:
Similar to the above category (Financial/Economical), this also has just one key delay; Contract Modifications (2.91). However there are two parties involved (Owner and Contractor) that have to carry the responsibility depending on the cause of the delay and the type of delay is also depending on what caused the delay.

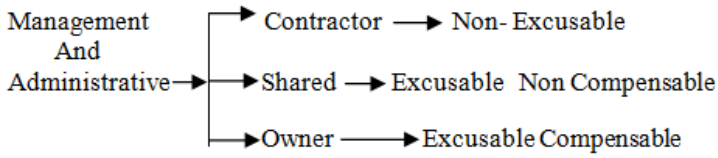

Figure VI, Management and Administrative

***Code Related*:**
This is the category that influences the most in delays, especially on projects built on the coastal areas. Very often (77.7%), the government is responsible for it and in this case they are excusable compensable delays. However, there is a chance of 22.3% that the Contractor be responsible for it in which the delays are Non-Compensable.

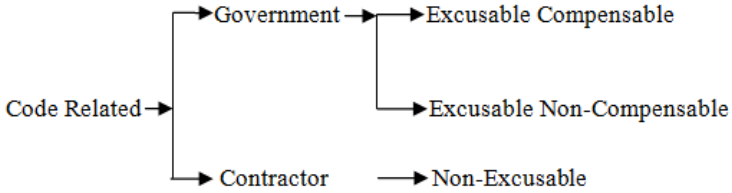

Figure VII. Code Related

IV. Conclusions For Case Study

Based on the results of the questionnaire survey and information gathered, the following conclusions were drawn.
Generally, whether a delay is determined to be excusable or non-excusable, a contractor is not entitled to an extension of time or to an upward adjustment in costs without Understanding the full context of the contract.

- Code-Related Delay is ranked as the most critical category followed by Design-Related Delays, Construction-Related Delays, and so on, as shown below:

1. Code-Related Delays
2. Design-Related Delays
3. Construction-Related Delays
4. Financial/Economical Delays
5. Management/Administrative Delays
6. Acts of God

- In general, the ten (10) most critical causes (across the six sub-headings given above) of delays are:

1. Building Permits Approval (3.83)
2. Change order (3.81)
3. Changes in Drawings (3.76)
4. Incomplete Documents (3.63)
5. Inspections (3.40)
6. Changes in Specifications (3.37)
7. Decision during Development Stage (3.35)
8. Shop Drawings Approval (3.23)
9. Design Development (3.19)
10. Changes Laws - Regulations (3.04)

- Based on the overall results, we can conclude that the following is the ranking of Responsibilities of the contractual from the most responsible (1) to the least (5):

1. Contractor = 44%
2. Owner = 24%

3. Government = 14%
4. Shared = 12%
5. Consultant = 6%

- It can be said that the most common type of delays are

Excusable Compensable at 48%,
Non-Excusable delays with 44%
Excusable Non - Compensable Delays with 8%.

In most of the cases, it is found that when the contractor has the responsibility, the type of delay respectively is Non-Excusable; when the responsibility is the owner's or the consultant's it is an Excusable Compensable Delay; and when the government is responsible, the delay is considered an Excusable Compensable. The consultants play a very important role in Design-Related Delays because as they are in charge of the design process in conjunction with the owner of the project. On the other hand, the government plays the most important role in Code-Related Delays. The contractor has the major responsibility for delays in Construction-Related Delays. Delays due to Financial/Economical Causes as well as Management/Administrative Causes share an intermediate position of importance, just presenting one Key Delay –Delayed Payments. These categories do not have the same negative impact on project
Completion times as other factors considered in this study such as code, design and construction related issues.

V. Conclusion

Construction clients demand the timely completion of projects without delay or additional cost. The findings from the views of construction stakeholders is that financial related delays such as financial / cash flow difficulties faced by clients, contractors and public agencies, design changes, delays in payment to contractors, information delays, funding problems, poor project management, compensation issues and disagreement are the top significant causes of delay in construction project delivery. Cost and time overruns and interest accumulation on capital are the most frequent effects of delay in the construction industry although the effects are slightly more on time overruns than cost overruns. Arbitration/litigation and total abandonment of projects were no longer seen to be the usual effects of delays.
However, it is therefore recommended that adequate construction budget, timely issuing of information, finalization of design and project management skills should be the main focus of the parties in project procurement process. Sufficient planning and the establishment of sufficient quality control mechanisms should be put in place to avoid design changes. Appropriate time should be allocated to careful production of designs and complete tender documents, so as to improve the quality of contract documents with minimum errors and discrepancies and reduce delay during the construction stages.

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