

# Causes and Effects of Delay in the Construction Industry in Egypt

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**Abstract** - The problem of delays in the construction industry in Egypt is a global phenomenon especially after revolutions. These phenomena occur leading to dispute, litigation and total abandonment making a high impact on construction projects. The delays can be minimized when their causes are identified. The main purpose of this study is to identify the factors of delay and their effect on the project completion. A literature review was conducted to compile a list of delay causes and effects that are most suitable to Egypt. A questionnaire survey was used to identify the importance of each of the causes and effects of delay. It was launched to two hundred experts from public/private sectors, clients, consultants, and contractors. The weight of each cause was obtained too from experts. The highest delay causes of the construction project in Egypt was determined and analyzed. The results had been viewed in phases, exact values for each cause of delay; exact values for each effect of delay and the top five causes of delay. The study represents a recommendation to minimize the delay in the construction projects in Egypt.

**Keywords**— *Construction Industry; Construction; Delay; Projects; Lack of finance, inexperience of contractor formatting*

## I. INTRODUCTION

The main objective of construction is to finish the construction on time and within cost which agreed and to achieve it in the good quality. According to (Assaf 1995) in construction, delay could be defined as the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project, while to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases. Time, cost and quality are the basic station for any successful construction project. Time and cost have parallel relationship which means that the increasing of the time will lead to the increasing of the cost. Then, controlling time is really important to avoid any loss to the contractor. Construction companies in Egypt aim to complete the project successfully, Project success can be defined as meeting goals and objectives as prescribed in the project plan. The success of projects depends on achieving meeting goals, objectives, and within budget limits. Management of project is mostly based upon tools and techniques which plays important role. Normally, when the projects are delayed, they are either extended or accelerated and therefore, incur additional cost. The normal practices usually allow a percentage of the project cost as an allowance in the contract price and this allowance is

usually based on judgment. Although the contract parties agreed upon the extra time and cost associated with delay, in many cases there were problems between the owner and contractor to check if the contractor have to pay the extra cost or not.

The scope of this study was to find the most critical causes and factors of delay in construction project in Egypt and supply the statistical result. A questionnaire had been distributed to engineers, contractors and consultants from different sectors (private & public).

The results of the study will be the guideline to the parties that involve in the project, so that delay can be avoided. A several factors that can reduce and minimize the possibility the delay occurrence in the construction project had been obtained too. Also, the effect of the delay in construction project had been resulted from the analysis of the questionnaire. The result of the study will provide the parties involved with a great background to prepare fulltime work and responsibilities to make sure that all the activities will be done according to its plan.

## II. RESEARCH BACKGROUND

In general, failure to achieve targeted time, budgeted cost, designer changes or errors, user changes, weather, late deliveries and specified quality result in various unexpected negative effects on the projects are the reason that delay occur. The type of delay can have an impact on non-critical activities which need a more detailed analysis to determine whether additional time extension is warranted, or if the reduction of float time can be justified. (Mohd Bin Mohamad 2010)

Although the contract parties agreed upon the extra time and cost associated with delay, in many cases there were problems between the owner and contractor to check if the contractor have to pay the extra cost or not.

(Abd el-kharashi and others 2008) identified 112 factors that cause delays in Saudi Arabia. The 112 causes were investigated by a questionnaire survey. The results were divided into groups. (Adel Al-Kharashi and others 2009).

(M.E.Abd el Razek and others 2008) identified 32 causes of delay in Egypt construction industry. They used a questionnaire survey to investigate the most important causes. The results showed that finance by contractor during construction, delay in construction payment by owner, design changes by owner and partial payment during construction are the top factors that affect the construction time line.

(Arshi S. Faridi and other 2006) conducted a study on construction delays in USA. By collecting the data using a survey they found that the top 10 problems faced by the construction industry in USA were: the shortage of manpower, skill of manpower, productivity, shortage of material, non-availability of materials on time, shortage of equipment, failure of equipment, defensive work, construction method, and construction mistakes.

Several studies were done to find out and identify the causes of delay in deferent countries. More than 50 researches work on different countries, from Middle east, Asia, Europe, USA and Africa; had been reviewed. Most studies had been done in special types of projects. However, this study was caring to collect most causes of delay in construction projects in Egypt, for any type of construction projects, and its impact factors on the project in addition to get some recommendation to minimize these delays and their effects. This study updated the current situation, after the changes all over the world in construction industry.

### III. METHODOLOGY

A questionnaire was developed to help in the data collecting process. The required data were collected from a group of clients, consultants and contractors. The goal of the questionnaire was to identify the main causes and effects of delay in Egyptian construction industry. The questionnaire was divided into three parts.

The first part focused on the causes of delay. The respondents were given a group of causes that leads to construction delays and were asked to select the importance of each cause using a five-point scale ranging from 1 (not effective at all) to 5 (very effective); where not effective at all means that the cause is not very important and it does not lead to serious delays while Very effective means that the cause is very important and it dose lead to very serious delays. In the second part the respondents were asked to identify who's responsible for each cause (owner/Clint, contractor, consultant or none). Also they were asked to give their recommendations on how to improve and avoided the delay problems that face the Egyptian construction industry through an open-ended question at the end of second part of the questionnaire. The third part of the questionnaire focused on the effects of construction delay in the Egyptian construction industry. The six effects of construction delay identified were: time overrun cost overrun, dispute, arbitration, litigation, and total abandonment. Also in this part the respondents were asked to give their recommendation about how to minimize the effects of construction delays through an open-ended question at the end.

### IV. TYPES OF DELAY

#### A. Introduction

Excusable delays can be further classified into excusable with compensation and excusable without compensation. Terry Williams revealed that there are three basic ways to classify delays:

- I. Excusable delay with compensation.
- II. Excusable delay without compensation.
- III. Non-excusable delay.[6]

#### B. Excusable Delay with Compensation

Compensable excusable delays are delays for which the innocent party is entitled to both a time extension and additional compensation for the resulting costs. The contractor may be entitled to both additional compensation and time. Excusable with compensation are caused by the client's actions or inactions. When contractors encounter this type of delay, they are entitled to time extension as well as monetary compensation due to the delays.

#### C. Excusable Delay without Compensation

Excusable without compensation are delays where neither the client nor the contractor is deemed responsible. When this type of delay is encountered, only a time extension will be warranted since there are no grounds for damages.

#### D. Non-Excusable Delay

Delays arising from the lack of performance of the contractor on a job are generally defined as non-excusable delays.

### V. DATA COLLECTION

To design the questionnaire a brainstorming and direct meetings with experts and professionals were held to identify the best way of questions to be asked in the questionnaire and to present a well-defined format. Moreover, an Arabic version of the questionnaire was developed to make it more easy and clear to get the right answers.

The questionnaires were lunched on March 2015. Throughout the questionnaire it was distributed to be 30% of the participants were consultants, 42% were employers (owners) and 28% contractors (figure 1) with different experiences as showed in (table 1), these verities in profession and experiences helped to get the most critical delay factors from different views.

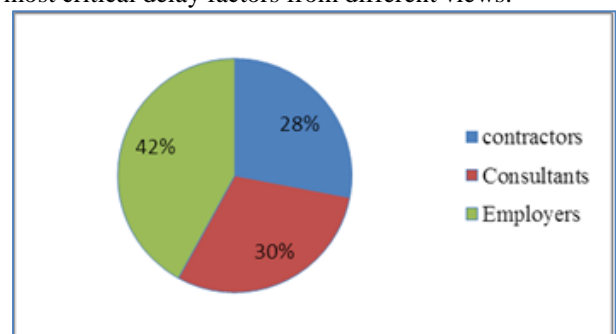


Figure V.1 Participants profession

Table V.1 Years of experience

Years of experience	Number of participants	Percentage (%)
Less than 5 years	62	31
5-10 years	50	25
10-20 years	48	24
More than 20 years	40	20

VI. METHODS OF ANALYZING DATA

Two methods were used to analysis the data, excel program and Descartes equation. First, an excel sheet was created. Each questionnaire's data was filled in the excel sheet. Tables for each section were created and the obtained rates were included. Charts were drawn using excel.

In order to determine the relative importance of the various causes and effects of delays the Relative Importance Index (RII) method were used, in addition to Descartes's equation. The five-point scale ranged from 1 to 5 was adopted and transformed to relative importance indices (RII) for each factor as follows:

$$RII = \frac{\sum W/5 * NR}{5 * NR} \quad (1)$$

Where:

W: the weighting given to each cause by the respondents (ranging from 1 to 5).

NR: the total number of respondents.

And 5 is the highest weight.

The RII value had a range from 1 to 0 where 1 is very serious and 0 is not inclusive. The higher the value of RII the more important was the cause or effect of delays. The relative index of inequality (RII) is a regression-based index which summarizes the magnitude of socio-economic status ((SES) which is an economic and sociological combined total measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education, and occupation. RII is useful because it takes into account the size of the population and the relative disadvantage experienced by different groups. The outcome is regressed on the proportion of the population that has a higher position in the hierarchy.

The RII is particularly valuable when comparing risk factors that are on very different scales. It is also great in ranking causes on each of the variables, Divide the ranks by the sample size, creating a value ranging from 0 to 1 and also for tied ranks and for categorical variables, assign the mean rank.

The higher the value of RII the more serious and effective the cause will be. The RII value has a range from 1 to 0, where 1 is the highest and the most important value while is a non-considered value.

The relative importance index method has made it very easy to identify the most significant causes and effects and also to rank both of them based on their importance value.

Descartes's equation:

$$W\% = \frac{(A+2B+3C+4D+5E)}{5} \quad (2)$$

Where:

A: total number of bubbled "1"

B: total number of bubbled "2"

C: total number of bubbled "3"

D: total number of bubbled "4"

E: total number of bubbled "5"

Also the average equation (the sum of all of the numbers in a list divided by the number of items in that list) was used to simplify the data collecting process, the formula was as follow:

$$X = \frac{1}{N} * \sum (X_i) \quad (3)$$

X: average (or arithmetic mean)

N: the number of terms (e.g., the number of items or numbers being averaged)

Xi: the value of each individual item in the list of numbers being averaged.

VII. ANALYSIS OF THE CAUSES

A. Contractors

A group of contractors with those ages are between (25-59) and working experience ranging between (3-35) years responded correctly to the questioner. After analyzing there given data the following graph (Figure 2) was plotted. The given graph shows the relation between the causes of delay and there importance index according to the point of view of the contractors

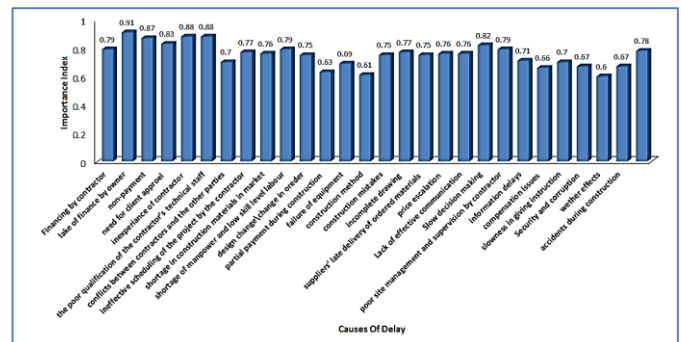


Figure VII.1 The relation between the causes of delay and the importance index according to the contractor

B. Consultants

Likewise, a group of consultants those ages are between (36-65) with working experience ranging between (13-43) years responded correctly to the given questioner. After analyzing there given data the following graph (Figure 3) was plotted. Similarly the given graph shows the relation between the causes of delay and there importance index according to the point of view of the consultant.

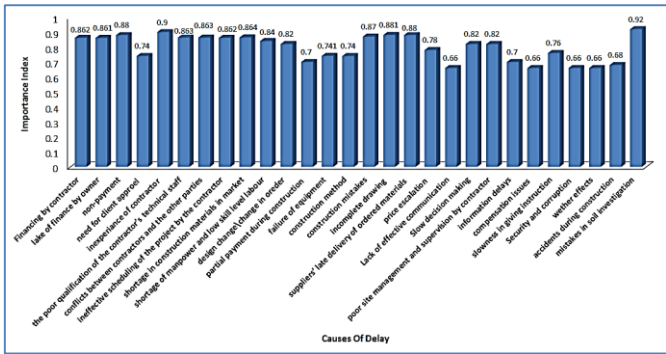


Figure VII.2 The relation between the causes of delay and the importance index according to the consultant

**C. Owners**

Finally, clients/owners those ages are between (51 - 25) with working experience ranging between (30 - 2) years responded to the given questioner. Similarly, the following graph (Figure 4) was plotted according to their point of view.

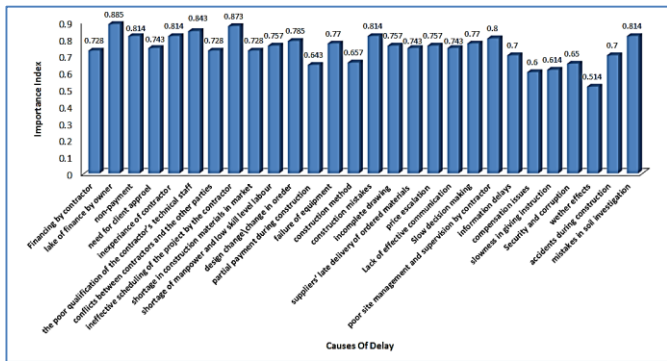


Figure VII.3 The relation between the causes of delay and the importance index according to the owners

**D. Analysis of the Overall Causes Results**

After dividing the analysis process into the three previous groups and getting the data of each group separately, it was the time to get the overall results of the analysis process. Using the previous 200 questioners to get the overall importance index for each individual cause of delay it was possible to plot the following graph (Figure 5)

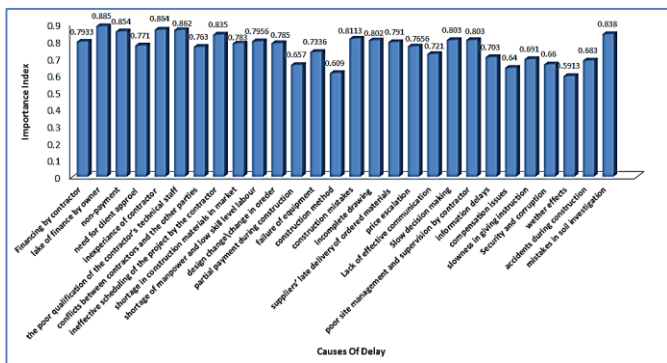


Figure VII.4 The overall relation between the causes of delay and the importance index

Based on this overall analysis of the causes of delay, the five most important causes of construction delays were:

- 1) Lack of finance by owner,
- 2) Inexperience of contractor,
- 3) The poor qualification of the contractors' technical staff,
- 4) Non-payment and finally
- 5) Mistakes in soil investigation.

**VIII. ANALYSIS OF THE EFFECTS**

Similarly the collected data about the effects of construction delay were analyzed from the perspective of clients/owners, consultants and contractors. The calculation of RII and the ranking were done as explained in the previous section.

According to the contractors, consultants and employers point of view the effects of delay were ranked plotted as follow in (Figure 6) for contractors points of view, in (Figure 7) for consultant point of view: and in (Figure 8) for the owners point of view.

**A. Analysis of the Overall Effects Results**

In this step also using the 100 questioner and with the help of the average equation it was very easy to determine and rank the effects according to the overall results.

According to the overall results of the analysis, the effects of delay were ranked as follow:

- 1) Cost overrun,
- 2) Time overruns,
- 3) Arbitration,
- 4) Disputes,
- 5) Ligation and
- 6) Total abandonment.

(Figure 9) explain the overall relation between the effects of delay and the importance index

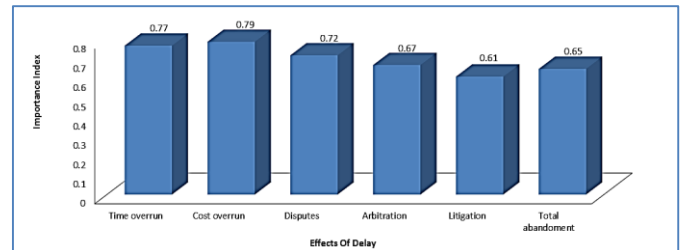


Figure VIII.1 The relation between the effects of delay and the importance index according to the contractor

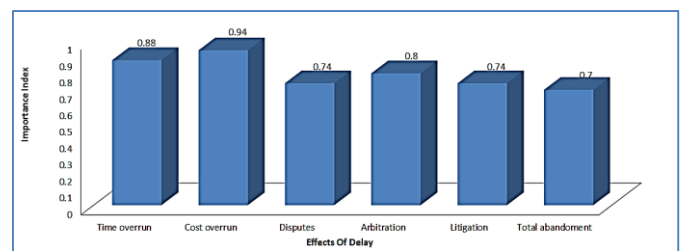


Figure VIII.2 The relation between the effects of delay and the importance index according to the consultant

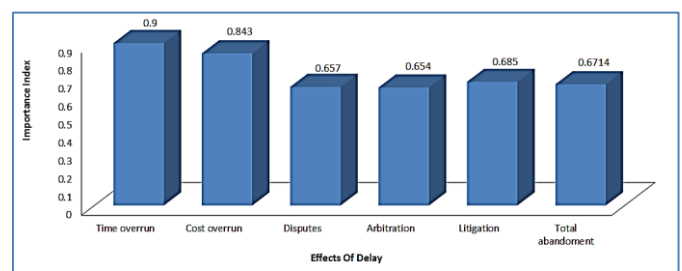


Figure VIII.3 The relation between the effects of delay and the importance index according to the owner



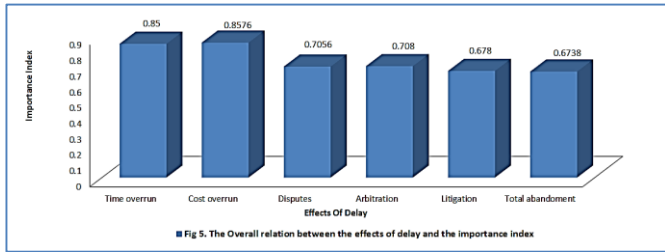


Figure VIII.4 The overall relation between the effects of delay and the importance index

IX. RESULTS

The causes of delay in the overall results were divided into eight categories which are: 1) The client, 2) The contractor, 3) The consultant, 4) The materials, 5) The labor and equipment, 6) The external factors, 7) The contract and finally 8) The contractual relationships. Each one of the previous categories contained several causes of delays. The overall results were as demonstrated in the following table (table IX.1)

Table IX.1 Results

Category	Causes of Delay	Very Low	Low	Medium	High	Very High
Client	lake of finance by owner	12	0	8	36	120
	need for client approval	4	4	48	72	48
	slow decision making	0	12	48	72	56
	no-payment	8	8	12	44	104
	partial payment during construction	4	28	84	44	16
Contractor	Financing by Contractor	12	0	32	64	68
	inexperience of contractor	4	4	28	36	104
	the poor qualification of contractor's technical staff	0	0	24	72	80
	construction method	12	32	72	40	20
	construction mistakes	4	12	40	44	76
	ineffective scheduling of the project by contractor	0	12	20	72	72
	poor site management and supervision by contractor	0	8	36	68	64
slowness in giving instruction	0	24	80	32	40	
Consultant	incomplete drawing	0	0	60	60	56
	information delays	0	12	80	64	20
Material	shortage in construction materials in market	0	20	36	72	48
	suppliers' late delivery of ordered materials	0	12	36	88	40
	price escalation	0	16	44	60	52
Labour and equipment	failure of equipment	0	28	52	52	44
	shortage of manpower and low skill level labour	4	4	40	80	48
Contract	design change/ change in order	0	8	56	60	52
	compensation issues	4	36	64	60	12
Contractual Relationships	conflicts between contractors and the other parties	0	16	64	64	32
	lack of effective communication	0	8	36	68	64
External factors	Security and corruption	4	28	56	36	40
	wether effects	8	60	56	44	8
	accidents during construction	4	16	76	64	16
	mistakes in soil investigation	4	24	24	40	70

The exact values of each effect of delay had been summarized in (table IX.2)

Table IX.2 Summary of results

Effects of Delay:-	Always Occurring	Occur	Medium Occurring	Rarely Occur	Never Occur
Time overrun	0	16	20	60	80
Cost overrun	0	8	16	72	80
Disputes	0	0	84	64	28
Arbitration	0	8	96	52	20
Litigation	0	32	64	64	16
Total abandonment	0	32	64	24	44

X. CONCLUSION

The aim of this study was to identify the main causes and effects of delay that face the construction projects in Egypt. A literature review was conducted to identify the causes and the effects of delay that are most stipulated in the Egyptian construction industry.

A compiled list of causes was obtained and subjected to further quantitative evaluation in a questionnaire survey to confirm their importance and to identify their rank. The most important causes identified by the survey, and based on overall results, were: 1) Lake of finance by owner, 2) Inexperience of contractor, 3) The poor qualification of the contractors' technical staff, 4) Non-payment and 5) Mistakes in soil investigation.

Both the contractor and the clients agreed that "Lake of finance by owner" is the most important causes when it comes to the delays, while the consultant believes that the "Mistakes in soil investigation" is the most critical cause. Also, the "Inexperience of contractor" and the "Non-payment" causes were both settled on by all the involved parties to be in the top 5 causes of delay. All the other causes witnessed disagreement.

For example, the contractor ranked "the need for the client approval" and "The poor qualification of the contractor's technical staff" as the third and fourth most important causes of delay.

However, the owner gave these causes a lesser ranking. Moreover, the owner ranked "Ineffective scheduling of the project by the contractor" which usually originates from the contractor as the second most important cause of delay, whereas the contractor did not include it in the top ten causes.

Also the consultant chose both the "Incomplete drawings" and "Suppliers' late delivery of order materials" to be in his top five list.

A correlation of the responses of each party showed the contractor and owner to have matching opinions concerning the causes of delay, while the consultant held somehow a different position.

Similarly to the causes of delay, using both the literature review and the questioners it was easy to identify and rank the effects of delay. A list of 6 effects was created and subjected to the evaluation. The ranking of the effects based on overall results, were: 1) Cost overrun, 2) Time overruns, 3) Arbitration, 4) Disputes, 5) Ligation and 6) Total abandonment.

All the parties agreed that both the "cost overrun" and "time overrun" are the most serious effects of delay. The other four effects were ranked differently according to each one of the involved parties.

XI. RECOMMENDATIONS

In the questioner, the responders were asked to give their opinion on how could we avoid or eliminate both the causes and effects of construction delays.

Using these opinions, lecturer review and after analyzing the results of the questioners it was very clear how can we avoid or reduce these delays.

It was easy to say that the top five that could be done to help in avoiding the construction delays in Egypt are as follow:

- Choosing good experienced contractors
- Good planning for the entire project
- Insuring that there is enough money to finance the project till the very end
- Strict and good supervision of the project
- Good communication between the project parties.

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