Time Overrun in Construction Projects of Developing Countries

Muhammad Akram Akhund1, Ali Raza Khoso2, Uroosa Memon3, Shabeer Hussain Khahro 4

1PhD. Scholar, Civil Engineering Department, Mehran UET, Jamshoro.
2Lecturer, Civil Engineering Department, Mehran UET, Jamshoro.
3Lecturer, Civil Engineering Department, Isra University, Hyderabad.
4Lecturer, Department of EM, CoE, Prince Sultan University , Kingdom of Saudi Arabia.

Abstract: Delay in timely completion is one of the main issues in public sector construction projects of developing countries. Time overrun can be defined as "a condition where a construction project does not complete within the designed schedule". Different stakeholders are responsible for delay in construction projects. This paper provides a conceptual framework to overcome this issue. Two important kinds of time overrun are considered in this study for developing the frame-work: one is excusable delay and second is non-excusable delay. Based on the frame-work it identifies the critical factors causing time overrun. This study is aimed to help the industry practitioners in taking necessary measures for avoiding delay in public Sector construction projects.

Keywords: Time overrun, Stakeholders, Construction projects, Developing Countries.

1. Introduction

Time overrun is defined as “a condition where a construction project does not complete within the designed time period”. It happens when the work of contract does not complete in its prescribed time [1, 2]. Time overrun is a most common incident which occurs nearly in all the projects related to the construction industry. Time delay is critical in developing countries where it exceeds its 100 % of estimated time while constructing a project [3, 4]. A lot of researches have been made to study delay causes in different countries. A study conducted by the Ogunlana et. al. [5] on delay in building construction projects in Thailand, as an example of developing countries. They summarized that in developing countries the problems related to the construction can be listed in three categories: 1. caused by incompetence of contractors; 2. caused of shortages of constructing material 3. caused by clients and consultants; and in Hong Kong Kumaraswamy and Chan [6] conduct a survey on the factors responsible for delay in construction projects which were observed by the clients, contractors and the consultants. They also studied the causes which affected the productivity. They discovered differences on important factors between these groups of their experiences, possible narrow mildness and lack of proper communication.

2. Time Overrun in Construction Projects

Generally a time overrun (delay) is a condition the actual work does not complete in an estimated time period. Most of the construction projects experienced from time overrun. Delay is the process in which the construction project slows down without stopping it entirely while suppression is the stoppage of the project directed from the clients to the contractor. Time overrun (delay) based on the two methods one is the Inexcusable delay (Non - Excusable delay and second is the Excusable delay shown in the bellow figure 1. to see if your print area fits within the space allowed.

2.1. Inexcusable delays (Non- Excusable delays)

Contractor or its suppliers are responsible for inexcusable delay and they are entitled to accelerate their work done in estimated time are to pay compensation to the owner. The contractor compensate on the basis either on liquidated damages or actual damages, provided that there is no section of liquidated damages in the contract. Ligated damages base on the daily rate of estimated costs which is likely to incur in the delay of construction projects the owner by the contractor.

2.2. Excusable delays

There are two kinds of excusable delays discussed as bellow:
2.1.1. Non-compensable delays: It is a delay which is not caused by the owner and the contractor rather it is acted by third party. Examples include natural calamity, unhealthy weather and wrong doing by masses (strikes, fires, acts of government in its sovereign capacity, etc). Due to this, contractor gets extension in tie and does not pay any compensation to the owner and contractor for delay damages.

2.1.2. Compensable delays: It is a delay which is not caused by third party but it is acted by the owner or the owner's agents. An example of non-completion of drawings in the required time by the architect of the owner and it leads to the extension of the schedule and it imposes economical damages to the owner by the contractor. In this condition, the contractor will have to face extra indirect costs for both extended field office and home office.

3. Previous Studies on Time Overrun

Many researchers have examined the main causes of construction delay in various types of construction project. In Egypt a study conducted by Gündüz, et. al., [7] in which he indicate that in the construction industry, The contractors increased their market share for achieving the maximum profit. To achieve this plan, the contractors examined the factors which are responsible for estimated impacts for the success of project before the bidding stage. These projects may differ in size, range, objectivity, ambiguity, complexity, deadlines, etc. Delay means is a situation where the actual work does not complete in an estimated time period which is agreed by the contractor.

In Saudi Arabia, Assaf et al. [8] conducted a research about time overrun (delay) in different kinds of construction project in the state. It was summarized that only 30% of construction projects were complete within the time while 70% of construction projects experience time overrun. This survey was investigated by 23 contractors, 19 consultant and 15 owners. In this researcher 73 factors of delays were identified and these factors were grouped into 9 categories. It was concluded in survey that all factors related to the labour, contractor, project, owner and consultant are on the highest rank and all three parties agreed to change order.

Sambasivan and Soon [9] has surveyed the causes of time overrun in Malaysian construction projects by surveying about 150 respondents. In this study he examined those 10 most important causes out of 28 different causes of delay. The ten most important causes were as bellow: Lack of communication between parties, improper planning, poor site management, inadequate contractor experience, inadequate client’s finance and payments for completed work, problems with subcontractors, shortage in material, labor supply, Equipment availability and failure and mistakes during the construction stage.

In this research Abdullah et. al., [10] classify the dominant causes of delay in large MA RA (Majlis Amanah Rakyat) construction project from the viewpoint of project management consultant (PMC). The method used is questionnaires surveys which are 12 large MARA construction project were selected for the survey. The data collected was analyzed by using SPSS software. The result shown the five most significant cause of construction delay are (1) cash flow and financial difficulties by contractors, (2) contractor's poor site management, (3) inadequate contractor experience, (4) shortage of site workers and (5) ineffective planning and scheduling by contractors.

Chan and Kumaraswamy [11] conducted a research survey in Hong Kong to evaluate and established the relative importance of significant factors which were responsible for delays in construction projects. They evaluated and listed the main causes of delays in two categories (a ) the role of the clients, consultants and contractor in the local construction project and (b) projects type. This research concluded that there were five main causes for delay in construction projects were: poor site management and supervision, unforeseen ground conditions, low speed of decision making involving all project teams, client initiated variations and necessary variations of works.

In Lebanon Mezher [12] took a survey from the owners, contractors, and architectural/engineering firms to find out the causes of delays in construction project. It was analyzed that economical issues were most concerned with owners and contractors give more importance to contractual relationships and consultants give priority to the project management issues.

Frimpong et al., [13] conducted a research survey in Ghana to evaluate and established the relative
importance of significant factors which were responsible for delays in ground water construction projects. A research of 26 factors on ground water drilling projects in Ghana through questionnaire was setup from the preliminary investigations conducted 1970 and 1999. The questionnaire was conducted from the three groups working in ground water projects were contractors, owners and consultants. The questionnaire was distributed in 125 respondents randomly out of which 55 respondents were owners, 40 respondents were contractors and 30 respondents were consultants. The outcome of survey revealed the main factors of delays in ground water construction projects were monthly payment difficulties from agencies; poor contractor management; material procurement; poor technical performance; and inflation of material prices.

In Jordan, a quantitative study carried out by Al-Momani [14] for identifying the delay causes in construction projects. It was summarized that there were 7 main causes of construction delay were the designers, user changes, climatic changes, and site conditions, late deliveries of material, economic conditions and increase in quantity.

Similarly, Odeh and Battaineh [15] also surveyed from the construction contractors and consultants to sort out main causes of delays in construction projects. It was concluded that the contractors and consultant indicated that the top ten most important factors were owner interference, inadequate contractor experience, financing and payments, labor productivity, slow decision making, improper planning, and subcontractors.

4. Data Collection and Analysis

Data collection was carried out using a structured questionnaire survey to understand the opinion of the construction practitioners to the time overrun factors. The targeted respondents were the stockholders registered with Pakistan Engineering Council (PEC). A five likert scale was adopted as 1-5 (Not Significant - Extremely Significant). Level of significance were assessed with Statistical Software Package SPSS using frequency and Average Index (A I) method calculated with formula adopted from Memon, A.H et al., [16]. AI is calculated by using the following formula. The ranking of all factors are shown in table. 1.

\[
AI = \frac{\sum(1X1 + 2X2 + 3X3 + 4X4 + 5X5)}{\sum (X1 + X2 + X3 + X4 + X5)}
\]

<table>
<thead>
<tr>
<th>No.</th>
<th>Factors of Time Overrun</th>
<th>A.I</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delay in shop drawings and sample materials</td>
<td>3.89</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Poor communication and coordination between parties</td>
<td>3.89</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Slowness in decision making process</td>
<td>3.25</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Suspension of work</td>
<td>3.10</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Inflexibility of consultants</td>
<td>3.05</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Late in reviewing and approving</td>
<td>3.05</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Design documentary by the consultants</td>
<td>2.99</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Conflicts between consultants and design engineers</td>
<td>2.99</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Absence of consultants at site</td>
<td>2.95</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Delay to finish and deliver the site work to the contractor</td>
<td>2.93</td>
<td>7</td>
</tr>
<tr>
<td>11</td>
<td>Change orders during construction by the owners</td>
<td>2.83</td>
<td>8</td>
</tr>
<tr>
<td>12</td>
<td>Financial problems (delayed Payments, financial difficulties, and economic problems)</td>
<td>2.80</td>
<td>9</td>
</tr>
<tr>
<td>13</td>
<td>Contract modifications (replace and add new works to the project; change in specifications)</td>
<td>2.60</td>
<td>10</td>
</tr>
<tr>
<td>14</td>
<td>Lack of consultant’s site staff Experience (managerial and supervisory personnel)</td>
<td>2.60</td>
<td>10</td>
</tr>
<tr>
<td>15</td>
<td>Supervision too late and slowness in making decisions</td>
<td>2.60</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>Unavailability of incentives for Contractor for finishing ahead of schedule</td>
<td>2.58</td>
<td>11</td>
</tr>
</tbody>
</table>

Excusable Delay (Non-Compensable)

<table>
<thead>
<tr>
<th>No.</th>
<th>Factors of Time Overrun</th>
<th>A.I</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fire</td>
<td>2.99</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Natural changing in environment</td>
<td>2.80</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Wind</td>
<td>2.78</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Snow fall</td>
<td>2.70</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Delay in Transportation</td>
<td>2.70</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Contractor modification</td>
<td>2.10</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>Labour dispute and strike</td>
<td>2.95</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Suspension in construction works</td>
<td>2.95</td>
<td>6</td>
</tr>
</tbody>
</table>

Excusable Delay (Compensable Delay)

<table>
<thead>
<tr>
<th>No.</th>
<th>Factors of Time Overrun</th>
<th>A.I</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Poor site management and</td>
<td>4.05</td>
<td>1</td>
</tr>
</tbody>
</table>
5. Result and Discussion

A total of 160 questionnaires were distributed randomly in different practitioners involved in construction industry in Pakistan. The resulting showing of received questionnaire set responses is 106, of which 10 questionnaire sets were filled incomplete and invalid for analysis. Table 2 shows the summary of data collection.

Table 2. Summary of data collection

<table>
<thead>
<tr>
<th>No. of questionnaires were distributed to respondents</th>
<th>160</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of questionnaires were received from respondents</td>
<td>106</td>
</tr>
<tr>
<td>No. of incomplete filled questionnaires from respondents</td>
<td>10</td>
</tr>
<tr>
<td>No. of questionnaires valid for analysis</td>
<td>96</td>
</tr>
</tbody>
</table>

On the basis of average index the top most factors of time overrun in the form of non-excusable, non-compensable and compensable delay found on construction industry site as follows.

### Non-Excusable Delay

1. Delay in shop drawings and sample materials.
2. Poor communication and coordination between parties.
3. Slowness in decision making process.
4. Suspension of work.

### Non-Compensable Delay

1. Fire
2. Natural changing in environment
3. Wind
4. Snow fall

### Compensable

1. Poor site management and supervision by contractor.
2. Poor communication and coordination by contractor with other parties.
3. Delays in sub-contractors work.
4. Delays in sub-contractors work.

The results of table 1: showing that, “Delay in shop drawings and sample materials” is the top most causative factor of time overrun (Non-Excusable Delay), similarly fire and Poor site management and supervision by contractor are also the top most causative factor of time overrun (Excusable Delays) with an average index 3.89, 2.70 and 4.05 respectively.

6. Conclusion

The issue of time overrun in construction projects has been unavoidable for many years. Its impacts are so numerous that it leads to slow down the completion of plans of any country. The improvement of time overruns causes both technical and project management related factors. This improvement may also improve the influence of human attitudes, behavior, skills and mentality. Similarly, taking the same issues and problems the delay network has been proposed by a different angle as shown in figure 2. The purpose of this study is to provide positive and negative factors which cause time overrun in a construction projects by the theoretical frame work for the future study. To validate the significant of the frame work it is required the reliability and criticality of the framework.

7. Suggestion

Suggestions’ to stockholders for controlling these excusable and non-excusable delays of time overrun in construction industry of Pakistan.

Stockholders playing a vital role for controlling the time overrun issues by applying these methods to the construction site.
Effective site management and supervision, Proper site investigation, Effective communication, Frequent progress meeting, Effective planning and scheduling, Effective site management and supervision, Establish system for design, Quality and experienced labor, On time delivery of materials, Effective communication, Effective financial management and control.

Acknowledgements
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Time overrun (Delay)

- Non-Excusable Delay
  - Non-Excusable Delay
- Excusable Delay
  - Compensable
  - Non-Compensable

- Delay in shop drawings and sample materials.
- Poor communication and coordination between parties.
- Slowness in decision making process.
- Suspension of work.
- Inflexibility of consultants.
- Late in reviewing and approving.
- Design documentary by the consultants.
- Conflicts between consultants and design engineers.
- Absence of consultants at site.
- Delay to finish and deliver the site work to the contractor.
- Change orders during construction by the owners.
- Financial problems (delayed Payments, financial difficulties, and economic problems).
- Contract modifications (replace and add new works to the project; change in specifications).
- Lack of consultant’s site staff Experience (managerial and supervisory personnel).
- Supervision too late and slowness in making decisions.
- Unavailability of incentives for Contractor for finishing ahead of schedule.

- Fire.
- Natural changing in environment.
- Wind.
- Snow fall.
- Delay in Transportation.
- Contractor modification.
- Labour dispute and strike.
- Suspension in construction works.

- Poor site management and supervision by contractor.
- Poor communication and coordination by contractor with other parties.
- Delays in sub-contractors work.
- Frequent design changes.
- Inadequate planning and scheduling.
- Lack of coordination on site.
- Difficulties in financing project by contractor.
- Improper construction methods implemented by contractors.
- Poor communication between contractors and other parties.
- Rework due to error during construction.
- Underestimation of productivity and inadequate review.
- Material Procurement.
- Material and fabrication Delays.
- Poor skill labour.
- Lack of high technology.
- Underestimation of productivity.
- Conflicts in sub-contractors Schedule in execution of project.
- Poor qualifications of the contractors and sub-contractors and technical staff at construction site.

Figure 2: Frame-Work of Time Overrun
References


