Scientific Journal of Impact Factor (SJIF): 5.71

e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 5, Issue 03, March -2018

RIVIEW ON THE ASSESSMENT OF DELAYS IN BUILDING CONSTRUCTION PROJECT

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Abstract — *The aim of this study is to investigate the factors that may cause overrun of the planned cost, allocated resources and scheduled time of infrastructure engineering projects in construction industry. The analysis showed that delay and cost overrun of infrastructure projects were caused by different factors according to the records in the collected final reports of projects. Cost overruns for building projects increased with contract prices. A significant effort was spent in collecting data on cost overruns and delays in public construction projects. However, data confidentiality did allow the collection of enough data to ensure the robustness of the developed regression prediction models. Cost saving and time performance is usually essential to all parties who are involved in a construction project, is owner, contractor, and subcontractor. The main causes of disputes in construction projects involve delay and failure to complete the work in the specified cost and time frame. The delivery time of a project is a key factor to the owner in terms of cost as much as it is for the contractor. Unexpected increase in cost and delays in construction projects are caused by owner, contractor, environments, etc. in which several types of risk factors may occur concurrently. The effect of cost overrun and schedule overrun do not only influence the construction industry but the overall economy as well.*

Keywords-*Project management; Cost variance; delay, cost overrun; planning and scheduling.*

1. INTRODUCTION

Cost saving and time performances are usually essential to all parties who are involved in a construction project, are owner, contractor, and subcontractor. The main causes of disputes in construction projects involve delay and failure to complete the work in the specified cost and time frame. The delivery time of a project is a key factor to the owner in terms of cost as much as it is for the contractor. Unexpected increase in cost and delays in construction projects are caused by owner, contractor, environments, etc. in which several types of risk factors may occur concurrently. The effect of cost overrun and schedule overrun do not only influence the construction industry but the overall economy as well. Even though construction project increasing in cost and schedule has received extensive attention of researchers, but because of continuous changes and development in the field, the study considered of added value to the construction industry, in addition to risk strategy and plan analysis. In order to meet the deadline of a project and due to the complex nature of construction projects, cost and scheduling should be flexible enough to accommodate changes without negatively affecting the overall project cost and duration. As such, the objectives of the presented research in this paper are to identify, study, and assess the effect of the factors that affect cost and time contingency. Time, cost and scope are project success factors, and they are commonly mentioned by many practitioners and researchers [1].In particular, predicting the required time to carry out the construction of a building has been of great interest for most professionals in the construction industry. A cost overrun is known as budget overrun or cost increase. It involves unexpected excess cost occurred due to underestimation of the expected budget of the infrastructure projects. Thus, it is important to study these cost overruns factors and to avoid them for maximum benefits and returns from infrastructure construction project. Most infrastructure projects in construction industry are characterized by overrun in cost and time. Problem of cost overrun is critical and needs to be studied and alleviated.

2. LITERATURE REVIEW

Some researchers have studied the reasons of and the factors affecting cost overrun and time delay in construction projects. However, there is a lack of studies concerned with the cost overrun and time delay in the implementation of infrastructure projects in construction industry. This study aims at investigating the most important factors that can be the reasons behind cost overrun and time delay of infrastructure projects in construction project by analyzing the final reports of these projects. Researcher studied the factors affecting the schedule and budget of the construction projects [2]. He conducted a field survey including 40 consultants in Palestine. The top affecting factors in the consultants' opinions are materials price instability, size of contract and incomplete drawings. The researcher stated that about all the projects suffering from cost diverge. Also it was found from the study that about 76% of projects have cost over estimation while 24% have cost underestimation. The difference between actual cost and estimated cost of construction projects has an average of about 15%.

However, in another study by the top factors affecting time overrun in infrastructure projects in Palestine were studied. The study showed that major factors delaying the studied projects include: financial problems of the contractor, delay of payments from the owners. Also, the study referred to the special political situation in the area of study and its significant influence on projects. Other important factors that may delay completion of projects such as poor communication among parties, lack of efficient machineries and tools and high competition among bidders, showed significant effect on projects' schedules.

In a study by a survey of contractors' viewpoint was conducted to investigate the top causes of cost overrun at the infrastructure projects in Saudi Arabia.[3] A list of 41 factors of cost overrun causes was considered. Among these factors, it was concluded that according to opinions of the responding contractors the top causes of cost overrun in infrastructure projects in Saudi Arabia are internal administrative problems, delay of payments, poor communication between construction parties and delays in decision-making. In other studies conducted in several countries, various results were obtained. For example, in Hong Kong Chan et al. [4] studied the causes of delays in construction projects. It was indicated that five causes are the main causes for projects delay. These include: poor supervision and management of construction sites, unpredictable ground conditions of the project sites, slow processes by decision-makers of the projects, and variation orders especially those presented by clients.

Another study example in India by Singh [5] concluded that the main causes responsible for delays of construction projects in India include: the lack of efficient project plans, contracts and implementation processes and procedures. An investigation of 31 variables was conducted on construction projects in Malaysia. The study showed that the most important causes of delay for the projects in Malaysia are related to financial aspects. The second and third most common factors causing delay of projects connected with coordination and materials problems, respectively. However, another study in Malaysia found that the most important causes of delay in construction industry are related to contractors and resources. Lack of proper contractor's project planning and site management, lack of adequate experience, improper coordination with subcontractors and other parties and making mistakes in implementation of the construction stages are major factors that affect the projects' completion duration. Other factors related to the construction resources include the insufficient financial resources from the client and shortage of materials, labors and equipment. Different literatures related to cost overruns and its causes found that inaccurate estimates and design changes at the time of construction are the most important factor directly affects the cost. The study also found it is necessary that the project management team have a good forecasting technique to know the future business environment. This will help the owner or agency to take decision regarding procurement of materials.

Another researcher found that the factors causing cost and time overrun in Florida Department of Transportation highway projects are plans modifications, changed conditions and lack of project coordination. In this study on Construction Projects concluded that when project costs are efficiently monitored while the other conditions kept constant, as construction project periods increase, a proportionate increase in their costs or value is recorded. In addition, when construction projects' expected or planned cost is increased, a simultaneous increase in their relative real cost must take place. However, though monitoring can efficiently reduce the project's cost overruns, the longer construction projects delay become the higher cost overruns.

A study by Al-Momani [6] investigated factors causing delay of public building construction projects in Jordan.
The study investigated 130 projects constructed during the period from year 1990 to year 1997. The results showed that critical factors that may cause delay of building projects include: design and implementation changes, weather and site conditions and financial conditions. It can be seen from the review of the previous literature that different results were concluded in the different countries. Also variable such as the source of data, the number of studied projects, the execution time period of projects, type and size of projects may significantly affect the results. In this study, the results depend on the records of final reports of 40 public infrastructure projects. Future studies may use different sources that can be compared to the results of this study for more evaluation and validation.

2.1. DEFINITION OF DELAY

A 'real' delay may be defined as a period during which a contractor cannot employ his men or machines or staff at their normal intended output, having regard to the nature and amount of work which is available under the agreed program of working or under any rearrangement or that program. "Construction period is the time gap between the commencement date and the completion date".

2.2. DELAY OF CONSTRUCTION PROJECTS

Delay is generally knowledge as the most common, lastly complex and risky problem encountered in construction projects. Because of the overriding importance of time for both the owner (in terms of performance) and the contractor in terms of money, it is the source of frequent disputes and claims leading to lawsuits. To control this situation, a contract is formulated to identify potential delay situations in advance and to define and fix obligations to preclude controversies.

2.3. FACTOR OF CONSTRUCTION PROJECT DELAY

The main factors for time delays and cost overruns are: 1) scope definition, 2) coordination of roles and responsibilities among involved parties, 3) initial estimation and contingency planning, and 4) monitoring and control systems [7]. Most construction projects in developing countries are characterized by time delays [8]. The projects with extensive delays may end up losing their economic justification, which in turn may result in the termination of the project [9].

According to other researcher based on the literature and the opinion of practitioners/Expert through fifty nine questionnaires, several imperative factors that affect cost and time contingency are identified and studied. They are divided into four major criteria: (A) Site conditions, (B) Resources, (C) Project parties, and (D) Project features related factors. Site conditions include environmental, Sub-surface and Site location. Resources include Labour, Equipment and Material. On the other hand, project parties cover Owner, Engineering & Design, Contractor and Project management. In addition Project features cover Financial, Political and schedule sub-criterions.

2.4. CAUSES OF CONSTRUCTION PROJECT DELAY

The following major causes of construction/delivery delays were reported: 1) insufficient data collection and survey before design, 2) higher than expected increase in costs due to inflation, and 3) repair/reconstruction work due to errors during construction [9]. The three most important causes for construction delay were improper planning, poor site management, and inadequate and/or limited experience [10]. The majority of cost overruns are encountered in lump sum contracts, fewer occur in unit-price contracts and even less in reimbursement contracts [11]. They reported the following causes of cost overruns: 1) awarding contracts to the lowest bidder; 2) site conditions; 3) incompetent subcontractors and poor site management; and 4) inaccurate estimates and client-led change orders. The following major cause of cost overruns were identified: 1) market conditions, 2) personal experience in the contract work, 3) insufficient estimated time for construction items, 4) material fluctuation, and 4) political situations [12].

One of the most important problems in the construction industry is delay. Delay occurs in every construction project and 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 are two kinds of causes for delay 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. The most frequent causes of valid delay claims are two. The first is where one contractor working for the employer fails to complete his work in time and so delays another contractor. The second is a change of design, which, though it is issued before construction commences on the altered portion of the work, nevertheless causes upset and delay to the contractor's work.

2.5. PROJECT COST OVERRUN

According to the researcher in [13] Project cost overrun have identified with the need for greater insight into cost estimation (contract sum) and overrun in construction projects. Logically one may assume, first because the cost estimate plays a major role in project decision-making processes and second, because its negative variance during the construction phase, leads to perceptions of poor project outcome.

2.6. EFFECTS OF DELAY

The two major delay damages are time extension and liquidated damages. The contractor will claim for time extension or for additional cost or will ask for both and the owner will ask liquidated damage for late completion of the project. The time extension is usually made to save the contractor from liquidated damages for late completion. We conceder the two as major effects of delay in building construction projects i.e. time extension and liquidated damage.

3. CONTROL OF CONSTRUCTION PROJECT

In construction all project are time bounded. The project time objective specifies the project completion time. Time delays results to penalties while early completion might earn rewards. However, in spite of one's best effort to complete a project on time, changes from the original plan may arise. There may be many reasons both foreseen and unforeseeable, for exceeding the time set to complete a project. However, the absence of project time plan almost makes certain that a project cannot be completed on schedule without incurring extra costs. A plan prepared well before the commencement of construction in a project can be instrument in formulating directions, coordinating truncations, setting targets, forecasting resources, budgeting last, can control performance and motivating people. It is for this reason that the project

should start with time planning and followed by controlling. In construction project the progress of the work according to the plan can be controlled through: Progress report on site, schedule control, cost control, resource control and by casting the completion date and cost. [14]

3.1. PROGRESS CONTROL

For effective control of a project an accurate reporting system showing the performance compared to the original plan, forecast of financial cost and completion dates, potential claims and delays and problems encountered and measures required to be taken is very important. This report will be the basis for corrective actions to be taken by management. They are also evidences for delay claims during arbitration. Even though daily records are kept on site reports for management are usually compiled on develops it should wait until the end of the month. In such cases immediate reporting is very important to take corrective actions before it gets worse. The main idea of recording all-important events on site and communication regarding the work is to complete the work in the specified time with a standard as stated in the contract agreement. The progress report prepared by the resident Engineer is a good tool to minimize delays in building construction projects.

3.2. SCHEDULE CONTROL

Control of a schedule requires the assessment of progress to date i.e. analyze performance. If deviation occurs identify causes and take corrective action. The analysis of schedule variance can be based on the earned value concept and s-curves. The schedule of construction projects is based on a predetermined quantity of resource (labor, material, equipment, and money) during the planning stage. Thus the completion of the project on schedule depends on the availability of these anticipated resources at the right time and quantity on site.

One way of controlling the schedule is assuring the timely delivery of resources according to the plan and their effective utilization. Unfortunately no projects go smoothly as planned due to many reasons. Situations make necessary the periodical control of schedule i.e. timely and frequent updating of schedule. Above all effective control mechanism will help in giving warning signals for schedule deviation. In some cases design changes or changes of scope (potential sources of construction delay) of working during construction may not allow to maintain the original schedule some additional cost is allowed for acceleration of the work. Once delay occurs the only way to maintain the schedule is to be willing to bear the additional cost.

3.3. RESOURCE CONTROL

The key to the success of a construction projects are the resources (labor, material, equipment, &finance) which are the means required to do the job. How these resources are managed and controlled will determine project cost and duration.

3.4. COST CONTROL

The main purpose of cost control in construction projects is to record the cost of the work items (activates) for the following use: -

- Detect if there are deviations from the original budget and forecast completion cost so that corrective actions can be taken measure efficiency for planning and cost estimation of similar future projects. The effectiveness of control depends on the accuracy of the original estimate done during planning stage.
- Cost control requires a detailed analysis of the project cost by splitting the project cost in to direct cost, indirect cost and over had cost and further in to labor, material and equipment cost. Thus requires proper coding system and extensive data collection. Cost control in roles
- Payment for works which is the source of delay when not done on time.

4. PLANNING AND SCHEDULING

Planning must be done in order to perform any function with a minimum of wasted time and effort. This is true whether the function is getting to work on time or constructing a multimillion-dollar building. Schedules are used as guide during the performance of an operation in order to control the pace activities and to permit completion of the operation as the desired or required time.

4.1. CONCLUSIONS

Estimating cost and scheduling contingencies are major factors in achieving a successful and realistic budget and schedule for construction projects. In the present research, a survey is sent to many construction companies to identify, qualify study, assess, and quantify the factors that affect budget and time contingency. The costs estimated before starting

the works are the only ones that have practical value in the model, and their use, on average, resulted in worse accuracy values regarding the use of the actual costs.

Cost saving and time performance is usually essential to all parties who are involved in a construction project, is owner, contractor, and subcontractor. The main causes of disputes in construction projects involve delay and failure to complete the work in the specified cost and time frame. The delivery time of a project is a key factor to the owner in terms of cost as much as it is for the contractor. Unexpected increase in cost and delays in construction projects are caused by owner, contractor, environments, etc. in which several types of risk factors may occur concurrently. The effect of cost overrun and schedule overrun do not only influence the construction industry but the overall economy as well.

4.2. SUMMARY

Finally, I have recommended that in the planning stage of any construction project, larger efforts should be exerted on the planning preparation, scheduling and cost evaluation to reduce the risk of delay and cost overrun of the project implementation. Similarly, during the construction stage of projects careful organization and management processes should be applied to fulfill the requirements of the projects' plans. Successful management of construction projects may need to adopt procedures to avoid problems and to adopt contingency plans to reduce the effects of problems when they occurred. Changes are facts of the construction process. They are issued to respond to newly developed circumstances. Extensive and poorly managed changes may have significant negative impacts on project time and cost performances. Two major problems facing the construction industry are project delays and cost overruns. In today's highly competitive economic environment, the need for completing construction projects within the stipulated cost, time frame, and expected performance expectations is becoming increasingly important.

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