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Causes of Cost Overrun In Construction

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ABSTRACT: *The Indian construction industry is an integral part of country's economy and its growth and a conduit for a substantial part of India's development investment. The industry plays a pivotal role in developing the country's infrastructure, a pre-requisite for high levels of economic growth. Most construction projects experience cost overrun and it put massive financial burden on the client or owner. Therefore this research was carried out to identify the causes leading to cost overrun in construction projects. Desk study along with questionnaire survey was used to identify the causes of cost overrun. A total of 30 filled questionnaires were collected from clients, consultants and contractors. The respondents were asked to rate the listed causes on the basis of probability of occurrence and severity of impact. Importance of each cause was calculated on the basis of cumulative effect of occurrence and impact. Spearman rank order correlation analysis was used to evaluate whether consensus of opinions exists between groups of respondents (client versus consultant, client versus contractor and consultant versus contractor). From the analysis of the results it was found that consensus of opinion exists between respondents on the causes of cost overrun. The results showed that, slow decision making, poor schedule management, increase in material/machine prices, poor contract management, poor design/ delay in providing design, rework due to wrong work, problems in land acquisition, wrong estimation/ estimation method, and long period between design and time of bidding/tendering are the major causes of cost overrun. The major causes as identified by this research were compared with the findings from other countries and there were fairly relevant similarities.*

KEYWORDS: *Construction projects, Cost overrun.*

I. INTRODUCTION

1.1 Construction Industry In India

Indian economy have been on a very positive development curve for years now, posting impressive growth rate percentages. The Indian construction industry is an integral part of country's economy and its growth and a conduit for a substantial part of India's development investment. It is poised for solid growth due to industrialisation, urbanisation and economic development together with people's expectations of improved living standards. The construction sector employs approximately 31 million people, accounts for some 6-8% of GDP and, after agriculture, is the largest employment sector in the country. In general, it has been growing at 9-11% year on year, primarily due to the strength of increased domestic and international manufacturing activities and industrial growth (Harris, 2011).The construction industry is primarily driven by government investments on core and urban infrastructure; industrial capital investment by corporate sector and development activities of real estate/housing sector. The industry plays a pivotal role in developing the country's infrastructure, a pre-requisite for high levels of economic growth. Major importance is placed by the government of India on bridging the infrastructure deficit. Massive investment is being done in the field. Construction sector accounts for nearly 45% of the total investment in infrastructure and is expected to be the prime beneficiary of the surge in infrastructure investment in the near to medium term. Development of adequate infrastructure to achieve/sustain high GDP growth is a priority for the Government of India. Despite slippages from targets, investments in infrastructure reported a compounded annual growth rate (CAGR) of 18% over the last three years, with the spending increasing to Rs. 4.0 lakh crore in FY 2009-10 from 2.4 lakh crore in 2006-07 (ICRA, 2011).

Development of infrastructure is key to growth within the commercial sector and it has been estimated that India needs to spend US$ trillions in the next few years to meet its infrastructure requirements. The government plans to source these funds from combinations of Public Private Partnerships (PPP), public investments and exclusive private investments while FDI is expected to provide liquidity to allow key rail, road, and power projects to continue to be built. India's infrastructure industry is currently experiencing unprecedented levels of growth, on the back of the expansion of the economy as a whole and continued infrastructure investment is expected to up the Tier II and Tier III

cities driving demand for new, high quality commercial developments (Harris, 2011).With the economy booming, the demand for all segments of the real estate sector is going to continue to grow. The Indian Government's decision to allow 100% Foreign Direct Investment (FDI) in the real estate industry has stimulated construction activities throughout the country. The Indian real estate industry is poised to grow from €7 billion in 2005 to €58 billion in by 2015. Given the boom in residential housing, information technology, organised retail and hospitality industries, real estate sector is likely to see increased investment activity. Foreign direct investment alone might see a close to six-fold jump to €19 billion over the next 10 years (Indo-Italian Chamber of Commerce, 2008).It would be prudent however to view the current growth with an element of caution; there is still a high level of national fiscal debt and there remains the risk of a slowdown in government spending (Harris, 2011). It makes cost effective planning and construction all the more important.

As with construction industry anywhere in the world, the Indian construction sector also face a lot of challenges from land acquisition issues, adverse political and structural changes, shortage of talent, design and constructability issues, and rising material and labour costs.Further, deficiencies in project planning, use of inappropriate procurement contracts and faulty contract management also contribute to delays in project implementation.(ICRA, 2011)Construction-related commodities costs are expected to continue to increase in the future, and these increases will be directly result in higher construction costs. The rate of rise in the prices is unlikely to slow down. Labour costs are also increasing and there is currently a shortage of high end skilled labour/experienced workforce in key city locations. This is likely to have a sizeable impact on tender prices and lead-in times, potentially requiring the use of less skilled labour teams to deliver fast-track projects. The impact could be a reduction in quality. As a result of the current levels of material and labour cost inflation and the buoyant market conditions, contractors are increasing their average margins by between 5% and 7%. These increases are reflected in higher tender prices, particularly on key landmark developments, although on smaller projects contractors are more likely to absorb the increased costs to remain competitive (Harris, 2011).

1.1 Cost overruns are very common in the construction industry. Hardly few projects get completed within original costs. 'According to the reply **Statistics Minister Srikant Kumar Jena** gave to the Rajya Sabha, as on March 31, 2012, 555 projects (worth Rs 150 crore and above) were on-going, out of which 179 projects reported cost overruns. According to the statement laid in the House by the minister, total cost overrun of these 179 projects was Rs 1.23 lakh crore. The minister said, "The major reasons for cost overruns are under estimation of original cost, change in rates of **foreign exchange** and statutory duties, escalation in cost of land, high cost of environmental safeguards and rehabilitation measures, **inflation** and delay in projects." The details provided by the minister reveal that the cost overrun of projects in railways sector was Rs 69,551.81 crore followed by Rs 15,886.71 crore and Rs 15,113.80 crore in petroleum and power sectors. The cost of projects escalated by Rs 6,187.54 crore, Rs 5,272.90 crore, 4,838 crore in steel, urban development and **atomic** energy sectors respectively' (The Economic Times, 8 March 2013).

1.2 Statement Of Problem

The basic goal in any industry is to achieve the completion of project within time and stipulated budget. It is the same with construction industry. The construction industry being one of the most complex, fragmented, schedule and resource driven industry, is always facing serious problems like low productivity, low quality, delay, cost overrun etc.(Memon et al., 2011). Cost overrun in construction is a worldwide phenomenon, and its effects are normally a source of friction between owners, project managers, and contractors (Creedy et al., 2010). Azhar and Farouqui (2008) observed that the trend of is more severe in developing countries. As the construction industry continues to grow in size, so do planning and budgeting problems. This is because it is common for projects not to be completed on time and within the initial project budget (Apolot et al., 2012)It is noted that there were more cases of cost overruns than time overruns. This makes the problem of cost overruns to be of great significance (Kasimu, 2012). In fact, it is one of the most important challenges facing the construction industry today. An out of control construction cost adds to investment pressure, increases construction cost, affects investment decision-making and wastes the national finance. Hence, it is important to identify the factors that contribute to cost overrun to avoid and reduce the problems (Ali & Kamaruzzaman, 2010). Identifying the reasons is usually the first step when addressing a problem, and then corrective action can be taken.(Chang, 2002)

George Jarfas (2010) notes that there is no single cause for cost and schedule overruns on construction and engineering projects. Although some of the factors may seem to be insignificant on one project, they may prove to be significant on another project, as the conditions of project are not always the same. It appears that, there is always be need for debate and further research because of the chronic problem of construction cost overruns (Kasimu, 2012). The identification of the cost related risks, underlying drivers and impediments for

effective management must be assessed in the contexts of three key stakeholders, namely clients, contractors and consultants (Doloi, 2012).

1.3 Objectives Of Research

Research Aim:

The aim of the research is to assess the causes leading to cost overruns on construction projects.

Research Objectives:

- To identify the causes that lead to cost overrun and to evaluate their relative importance.
- To get opinion on these causes from major players in the construction industry namely contractors, clients and consultants.
- To test the strength of association between the rankings of the respondent groups.
- To rank the causes of cost overrun on the basis of importance.
- To assess how frequent each of these causes occur.
- To assess how severe the impact of these causes will be on the total cost of the project.
- To assess which causes need the most attention by stakeholders.
- To compare the findings of this thesis with the findings of research based on other countries.
- To compare the results with those of previous studies from other countries.

II. LITERATURE REVIEW

2.1 General

A 'construction project' is a high value, time bound, special construction mission of creating a construction facility or service, with predetermined performance objectives defined in terms of quality specification, completion time, budgeted cost and other specified constraints (Chitkara, 2011).Cost is one of the five main parameters that can sufficiently define a construction project. Other parameters are scope, quality, resources and completion time. The five parameters are interactive, that is, each parameter is a function of other. The evaluation and balancing of interrelationship among the five project parameters is a complicated process. However, in a given project, the scope and quality of work in terms of quantity and specifications are specified and these parameters are not subjected to change (unless scope changes substantially). Resources and costs are co-related. Therefore, for a given quality, in such situation, time, cost and scope are core parameters. These parameters are interlinked and must be kept in balance to achieve project objective efficiently and effectively within changing environments (Chitkara, 2011).Nowadays, even a marginal cost overburden can sweep away the profit of a job, and continuous cost overburdens in most of the projects of a firm can lead to bankruptcy (Akinci & Fischer, 1998). Organizations face a major challenge in controlling project budgets over the time span between project initiation and the completion of construction. The development of cost estimates that accurately reflect project scope, economic conditions, and are attuned to community interest and the macroeconomic conditions provide a baseline cost that management can use to impart discipline into the design process. Projects can be delivered on budget but that requires a good starting estimate, project management discipline and an awareness of factors that can cause cost escalation (Shane et al., 2009). This necessitates finding the relevant factors and causes that lead to cost overrun.

2.2 Definitions

Cost is the budgeted expenditure, which the client has agreed to commit for creating/acquiring the desired construction facility (Chitkara, 2011).Cost overrun is defined as the difference between the actual and estimated costs as a percentage of the estimated cost, with all costs calculated in constant prices. Actual costs are defined as the accounted costs actually spent, as determined at the time of project completion. Estimated costs are defined as the budgeted or forecasted costs at the time of project approval, which are typically similar to costs presented in the business case for a project (Lee, 2008).

2.2.1 Classification of Construction Costs

The cost of a work unit is comprised of many cost elements. These cost elements include labour costs, material costs, plant and machinery costs, administration costs and other expenses. In order to identify costs associated with an activity, construction costs are categorized into 'Direct costs' and 'Indirect costs' or 'Overhead costs'. Direct Costs: Direct costs are costs that can be correlated to a specific activity or a work item, which is being done or produced. Direct cost of permanent work item = Direct material cost + Direct labour cost other direct expenses

Direct material costs cover all costs connected with materials, which are incorporated into permanent works of the project. Direct labour costs cover net expenses far procurement, maintenance, and wages of all category of workers employed at the work site for the execution of an item of project. Other direct expenses include all other expenses on account of services rendered, which can be directly attributed to and clearly identified with the execution of an activity or work item. Indirect Costs: Indirect costs include all costs, which are attributable to a given project but cannot be identified with the performance of a specific activity or a work package. In other words, all costs other than direct costs are covered under indirect costs.

2.3 Causes Of Cost Overrun

According to Chitkara (2011), the main controllable causes of the projects' cost overruns include but are not limited to the following:

[1] Inadequateproject formulation: Poor field investigation, inadequate project information, bad cost estimates, lack of experience, inadequate project formulation and feasibility analysis, poor project appraisal leading to incorrect investment decisions.

[2] Poor planning for implementation: Inadequate time plan, inadequate resource plan, inadequate equipment supply plan, inter-linking not anticipated, poor organisation poor cost planning.

[3] Lack of proper contract planning and management: Improper pre-contract actions, poor post-award contract management.

[4] Lack of project management during execution: Insufficient and ineffective working, delays, changes in scope of work and location, law and order.

III RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Cost overrun in construction projects are as a result of many causes. Each cost overrun causes have different rate of occurrences and impact on the project cost at completion. Some causes may happen frequently but their impacts on cost may be less severe. Whereas some other causes may happen rarely but their impact may be severe. Therefore, it is necessary to identify cost overrun causes based on both occurrences and their impact, in order to rank their overall effects on cost overrun. This helps to prioritize the factors and, hence to determine the mitigation actions to be taken. In this chapter, the research design and methodology followed to achieve the ultimate goal of the research which is specified previously will be discussed. In addition data and information sources, research instruments, sample size and method of analysis are presented.

3.2 Research Design

The strategy followed in this research was first started with problem identification which has been done through unstructured literature review, archival study and informal discussion with colleagues and professionals in the sector; and then the research design was formulated. Then data and information sources were determined based on the formulated research design. On the basis of the data and information sources the research instruments were decided; and available documentary sources relevant to the research were reviewed. The review include books, journals, internet sources and other documents. After an in-depth literature review and desk study a questionnaire listing the various causes of cost overruns were distributed to reputed construction contractors clients and consultants to get their professional opinion based on experience. Upon obtaining the desired data, checking and sorting of data has been done. The data were then analyzed for cross-checking the validity and conformity of the information obtained through the overall research work. This was followed by thorough discussions in order to draw a conclusion and to forward recommendations based on the findings of the study. An objective type survey design was used for this research. It was attempted collect data from relevant population to rank the causes of cost overrun on the basis of importance. This survey-based research design has been selected as it is useful in demonstrating the prevalence of the problem throughout the population. Once the distribution of the problem has been determined and major causes identified, it may be possible to get hints on how to prevent the problem. It also helps to identify differences among groups and to recommend possible remedies to be taken by respective stakeholders.

3.3 Sources Of Data And Research Instrument

The research instrument used to identify and rank causes of cost overrun in this research was questionnaire survey. It was employed to get professional opinion and other relevant data through questionnaire. Besides this a literature review to develop conceptual basis for the study was also conducted. Through the literature review, potential causes leading to cost overrun, effects of cost overrun and methods of controlling and managing cost were identified. The review provided the basis to design the questionnaire which was distributed to professionals involved in the construction sector.

Owing to the large number of public agencies that own construction projects and the large number of contracting and consulting companies that undertake work for public agencies a survey by questionnaire was found appropriate. The questionnaire was designed in such a way as to get high response rate from respondents. Only closed-ended questions and Likert Scale options were used so that responding was easier. A pilot study is conducted with an experienced person in the construction industry who was asked to critically review the design and structure of the questionnaire, to ensure that the questionnaire will serve its purpose when distributed to stakeholders in the industry namely, clients, contractors and consultants. For the questionnaire survey, the respondents were randomly selected from construction sector. Care was taken to select different respondents from contractor, client and consultant groups. The questionnaires were given to potential respondents either personally and in a few cases through e-mail. The questionnaire consisted of close-ended questions.

IV DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This Chapter deals with the analysis of the information gathered from the questionnaire survey; which includes identification and analysis of rate of occurrences and impacts of causes leading to cost overrun in construction projects, noting the difference in perception of stakeholders, checking for correlation of stakeholder perception, ranking of causes in terms of importance, response details on top causes and the importance of different categories of causes.

4.2 Details Of The Questionnaire Survey

This section presents the results of the questionnaire survey which was used to get the opinion of major stakeholders in the construction industry. This subchapter will present the results on the causes of cost overrun on the basis of their opinion. The causes are ranked and arranged on the basis of probability of occurrence, severity of impact and overall importance. The results of the questionnaires are presented and analysed in the subsequent sections.

4.2.1 Questionnaire Response Rate

As state before, for the purpose of getting information on the perception on causes of cost overrun, questionnaires were distributed to clients, consultants and contractors.

A total of 35 questionnaires were distributed to representatives of client, consultant and contracting organizations in the construction sector and 30 questionnaires were filled and returned. The valid response rate was 85.71%, which is a high percentage. Table 4.1 shows the number of questionnaires distributed to the stakeholders and the number of questionnaires returned along with the response rate % for each stakeholder category.

4.3 Causes Of Cost Overrun From Questionnaire Response

Many causes of cost overrun have been listed from the literature review in chapter 2. But the causes of cost overrun in those previous studies were from the view of a particular stakeholder or focusing on a particular area or country. This makes it necessary to know the view of construction stakeholders in our region, in India. Knowing the causes allows us to prioritize action to mitigate cost overrun. The basis of results in this thesis is the questionnaire survey conducted among the stakeholders in construction industry. The causes of cost overrun were first examined on the basis of responses from clients, consultants and contractors separately. The causes were ranked on the basis of occurrence, impact and importance as responded by the different stakeholders. From 3.5.2 equations 3.1 was used to find Mean Score Occurrence, equation 3.2 was used to find Mean Score Impact, and equation 3.3 was used to find Cumulative Mean Score for Importance. The rankings by each category of stakeholders will be correlated using spearman's rank correlation to see if the responses can be taken as a whole to determine importance.

4.3.1 Causes of Cost Overrun as Responded by Clients

"Slow decision making" was ranked as the cause with the highest probability of occurring and having the highest impact, and making it the most important cause of cost overrun according to clients. Many of the clients who responded were part of government authorities and they worked with government infrastructure projects.

4.3.2 Causes of Cost Overrun as Responded by Consultants

"Poor design/delay in providing design" was ranked first in importance by consultants. It was also first in terms of impact on cost. But it is interesting to note that it was ranked only 4th in probability of occurrence. Since the responsibility of providing the design lies with the consultants themselves, the high ranking suggests consultants acknowledge a critical area of project management. "Poor schedule management" was ranked 2nd in

terms of importance and was 1st along with increase in material/machine prices in occurrence. "Poor schedule management" was ranked similarly high with similar importance by clients also, yet they are ranked a lowly 13th by contractors, as we will see in section 4.3.3. Keeping up with the schedule is a responsibility of contractors

4.3.3 Causes of Cost Overrun as Responded by Contractors

The most important cause according to contractors was "non performance of sub contractors". It is usual practice by contractors to award smaller works in the main contract to sub contractors. Many a time, this is not based on technical qualifications or eligibility criteria. Sub contractors may have not have sufficient experience or technical knowhow to efficiently do the work. "Non performance of sub contractors" was ranked comparatively low by both clients and consultants, because ultimately the contractors have to bear the responsibility for it. "Increase in material/machine prices" was also ranked high in second place. It was also ranked high by both clients and consultant

V CONCLUSION

Construction industry is one of the main contributors to the economic development of a country. The Indian construction industry is an integral part of country's economy and its growth and a conduit for a substantial part of India's development investment. The construction industry is primarily driven by government investments on core and urban infrastructure; industrial capital investment by corporate sector and development activities of real estate/housing sector. The basic goal in any industry is to achieve the completion of project within time and stipulated cost budget. Study of previous literature revealed that cost overrun is a very common phenomenon and it affects projects greatly. Many studies point out that the situation is more severe in developing countries. The government owned projects are the least cost efficient. According to data laid out at the Indian Parliament, total cost overrun of 179 ongoing government projects was Rs 1.23 lakh crore. Therefore, identification of causes leading to cost overrun and assessing its impact and frequency is necessary to avoid or reduce cost overrun and its effects. The main objectives of this thesis are to identify and analyse the causes of cost overrun in construction. To achieve the objectives, the thesis research used desk study and questionnaire survey as research instruments. Clients, consultants and contractors were asked to identify and rate the causes of cost overrun. The respondents were asked about the probability of occurrence and severity of impact of the listed causes in the questionnaire. The data collected using the questionnaires was analysed using mean score method. Spearman's rank correlation coefficients were found out to reveal agreements between opinion of clients and consultants, between consultants and contractors, and between contractors and clients.

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