Success Factors for Cost Management Process in Construction Industry

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Abstract:
Construction Projects are becoming highly-risky and complex due to cost management. This results in a pause or completion, or some other problems of that kind. In most designs, the conventional approach is primarily in vogue in the Indian building industry. It would be helpful to define key performance drivers to devise successful methods for minimizing building project costs. The construction industry is an important part of the infrastructure of India and a significant contributor to economic and social growth. It is the second largest industry and it is a very dynamic market. Cost management is the process used to control the cost of the project while maintaining the scope of all the deliverables. Therefore the cost management process (CMP) is important to control the expenditure at every stage of a project from its inception through its development, design, execution, final payment and closure of a project. This paper is focus on to recognize important factors leading to the cost overrun in the process of cost management. In addition, numerous specialists such as project managers, advisors and contractors were directly consulted to obtain functional concerns via a survey questionnaire. The replies have been clustered and appropriate methodologies have been formulated to address the problems that are appropriate for our Indian scenario.


I. INTRODUCTION
Next to agriculture in India, the construction industry is the second largest market. The foundation of the Indian economy consists of this sector. Not only does it provide infrastructure for all other industries, but, according to gross domestic product, it is also one of the main single sectors in the economy alone (GDP).

The construction sector employs around 51 million people. Any year, investment in the construction sector is expected to rise steadily at a rate of 7.1 percent per year. It contributes more than 9% to the GDP of the nation and 78% to the production of total wealth. State and central governments’ overall capital spending will be Rs. 30,42,230 crores in 2020-21 from Rs. 8,62,687 crores in 2011-12. The Planning Commission estimated that investment requirement in infrastructure sector will be about Rs. 50 trillion or US $777.73 billion (Government of India report of planning Commission, 2016).

Due to cost overruns and cost control, construction projects are getting more complicated and potentially risky. This often results in either delay or malfunction, or other problems of this nature.

The various factors that contribute to the failures can be classified as (i) external and (ii) internal. The external items, such as political impact, natural calamity etc, are beyond our control. Therefore, internal variables such as human-related factors, project-related factors, project processes and project management behaviour are only considered for this analysis to figure out the aspect that affects construction cost management.

Cost management is the mechanism used to monitor the project's cost while retaining all the deliverables' reach. The cost management mechanism (CMP) is therefore essential to monitor expenditure through the creation, planning, implementation, final payment and closure of a project at any point of a project from its inception.

Without integration with the time schedule and efficiency, cost management can not function separately. Cost and scheduling are closely connected because, through their control phase, they share a lot of similar data.

Cost management also includes resource planning, estimating. The use of resources like men, money, machines, materials, etc. emphasizing on time management is probably the ideal cost management.

In construction cost management may be implemented from the stage of planning, estimating, designing, tender bidding, materials purchase, machinery usage, financial allocation, budgeting and monitoring, men and materials handling etc.

From initiation to completion stage of a construction project there are different stages and activities quantitatively and qualitatively. So this study concentrates on both quantitative and qualitative analyses. As far as the different quantitative activities, the Cost Management ensures the resources planning of people, materials and equipments and what quantities of each should be used to perform project activities. So, the Project Cost Management is thus concerned with the cost of the resources needed to complete various Project Activities.

In addition to the above, the cost management of various activities is possible only when efficient Project Managers are involved. Sophisticated Project Cost Management tool along
with all management knowledge areas is essential for cost management.

Therefore both quantitative and qualitative analyses have been carried out by collecting data through various survey questionnaires, by conducting personal interviews.

India’s new economic policy has opened up new avenues and vistas for the development and growth of various sectors. It is essential that infrastructure development should keep pace with the developmental activities of the other sectors. This has resulted in a lot of pressure on the construction activities.

Cost is the project's basic resource. Cost overrun happens if the project management is unable to adequately monitor the project processes from start to finish.

Identify reasons that could cause delays and cost overruns and other factors that could lead to costs escalating without actually causing delays.

Despite following the cost containment process, the majority of projects demonstrate persistent cost overruns and escalation. The research analysis examines critical aspects shaping the successful application of cost control. For workers who work on the various stages of construction in order to effectively execute the job, interpretation of these considerations is beneficial. The key purpose of the research analysis is to provide the project management teams that apply for the project's performance with crucial knowledge about factors affecting the cost management process. Fig. 1 shows the cost management process in construction project.

**FIGURE 1: COST MANAGEMENT PROCESS**

II. LITERATURE REVIEW

The paper containing the work done by various authors and the outcomes of various research papers. Paper published in various national and international journals, Ph.D. Thesis, reports and books have been studied. They enhances knowledge to understanding the subject and provide extensive background to carry out work ahead in proper flow.

The critical literature review on different basis is discussed below.

**Ellinwa et al. (1993)** observed that “the shortages and cost of materials, fluctuation in prices of materials, mode of financing and payment for completed works, fraudulent practices and kickbacks, poor contract management are the major factors for the cost overrun in the construction projects. Minimizing or totally eliminating communication problem on site will help in reducing construction costs. Decision that impact a project should be communicated to the affected parties in the field either in writing or through verbal communication directly to the affected party”.[27]

**Naoum et al. (1994)** it was hypothesized that the project can be successful and the client can be satisfied even if the project is highly complex, provided that the appropriate procurement method was selected for the project according to the client's requirements. It was found that the MC system was employed on higher-cost buildings and projects with higher complexity and faster building rates, yet a significant number of these projects were found to be completed on time and within the estimated budget, and the client was satisfied. Similarly, when the traditional contracts were selected for projects with low or moderate level of complexity according to the client's priorities, these projects were successful and the client was also satisfied. [23]
Kang et al. (1998) pointed out that “The Construction Information Classification System (CICS) is useful for planning a project with accuracy in the handling of information during development. The four-faceted CICS helps project managers to control a project with standard data for both cost analysis and schedule preparation. In such a popular information system, CICS helps to align project costs for a project coordinator with a site manager's construction plan, and the connection between cost and schedule can increase the management of information for a construction project”. [16]

Chua et al. (1999) has implemented the AHP approach to classify CSFs for building projects. A hierarchical model for the progress of building projects is presented. The study findings indicate that experts believe that different collections of CSFs exist with different project goals. The results demonstrate that the performance equation should not be left out of project features and contractual agreements. In other words, project success is not determined exclusively by the PM, monitoring, and control efforts. In summary, the plausibility of project success can be increased if inherent characteristics of the project can be thoroughly understood, appropriate contractual arrangements are adopted, competent management team is assigned, and sound monitoring and control system is established. The CSFs identified in this study were found to be consistent with those determined in a previous study using a neural network with quantitative data. The AHP method is not only viable to identify CSFs but it allows intangible factors to be considered as well. [10]

Al-Jibouri et al. (2003) identified multiple types of leadership and their use for program cost control. Theory-based comparisons of these systems have shown that under different situations, multiple systems are optimal. For example, the ‘activity-based ratios’ methodology is more suited for short-term applications than the form of ‘variance’. Comparison observations have also found that some methods are simpler and faster to understand than others. It is necessary to consider the amount of information required by the system depending on the system to be used, and hence its use as a communication tool. It can also be concluded, on the basis of the studies carried out, that the effectiveness of control systems in describing project productivity anomalies varies considerably from one system to another. Some devices are more effective in illustrating the need for control action than others. They showed that both the 'Action dependent ratios' and the 'Variances' techniques have shown better than the 'Leading Parameter technique' the impact of cost factors on the method. The ‘Action dependent ratio’ methodology has also been shown to provide a smoother and better indicator of the general success of the work than the other two systems. However, it remains very difficult, on the basis of the minimal data provided, to generalize these results. [22]

Chan et al. (2004) concluded that “web based documents and the displayed information’s will be useful for construction cost management and the system retrieves useful data from the original documents and reorganizes the information according to specific tasks or users”. [24]

Rajguru et al. (2005) evaluated numerous optimization strategies. It is necessary to minimize the construction cost and length at each point. It is important to satisfy today's standards and to complete the project within the expected time, expense, and resources available. Project and inventory delays primarily impact the cost aspect of the project. To evaluate the time-cost concerns, many approaches have been developed and implemented, but only one parameter can be optimized. Various low cost material also suggested for optimizing the cost of project along with maintaining the quality and strength of the project. Also various mathematical method and software based models studied for optimization. [5]

Anand et al. (2005) observed that, in terms of its reach and approach, the current analysis of cost control activities in the Indian industry is exceptional. It not only deals with conventional methods of cost accounting, but also with new management tools such as costing depending on operation. In general, the theories deal with the disparity in approaches across industries, periods, and degrees of contemporary techniques' acceptance. The organizations are effective in gathering reliable cost and benefit details for value chain and supply chain research from their ABC cost structures. The findings show that businesses have more insight into benchmarking and budgeting using the ABC expense system, but unlike companies that use conventional costing methods, there is a lack of continuity with their priority budget targets. However, in contrast to the principle, Indian businesses use absorption costs and contingent costs regardless of whether or not they use activity-based expense mechanisms, both the ABC and conventional cost system consumers have specific explanations for successful application of the planning and budgeting mechanisms in their organizations. There is no major variation between the ABC and conventional users of the costing system in the use of standard costing. This means that there is no reciprocal exclusion between the usage of activity-based cost structures and normal costs. Sales fluctuations and inventory variances vis-à-vis labour and overhead rate variances are commonly used (variable and fixed). [17]

Chester et al. (2005) identified a comprehensive scenario with precise descriptions of construction defects or unexpected situations. A project expense has been estimated for each of the seven scenarios mentioned and the degree of delay has been determined. Costs were dependent on the amount of work to be carried out, the quality of the work, the added material, and the additional equipment. Summarizes the percentage increases in cost mentioned in the “Claims” section as well as the days delayed associated with it. Although most of the outcomes show delays resulting from the issues described, this is not always the case. There is the possibility that other variables can come into play that try to cope with the schedule impact. For example, in the delay scenario, it is not unlikely that later on in the project workers will be forced to accelerate to make up for delay that resulted from the extended completion of the foundation. The scenarios presented in the project with the corresponding time and costs isolate single timeline impacts. Common harm arising from problems on construction sites involves direct costs of material, labour, supervision, and machinery in the cases mentioned. Office overhead and inefficiencies require indirect charges. The construction claims process is not a science. Claims targeting delay issues can be formulated multiple ways. This occurs because the claims process could involve settlements, mediations, arbitrations, and juries. The claim process may start with the intention of settling so the damages may be exaggerated in hopes of bringing the settlement cost up. Other times, contractors may seek damages for exactly how much is needed to break even on the job or to regain their
Iyer et al. (2006) observed that the amount of contribution of different success factors varies with the project's output scores. The "commitment of project participants" has the strongest positive impact on plan fulfillment at low levels of schedule success ranking, but its meaning might not be noticed so much when the performance level is high. When the standard of performance ranking is already high, the "competence of the owner" is found to contribute more to further enhancing performance. This factor determines the value-adding variables in the output of the schedule and it is recommended that the project manager should analyze the real performance very specifically and strive to focus on only value-adding variables to boost the performance of the schedule rather than waste efforts on non-value-adding variables. The project manager's skill in such a situation plays a very significant role. [15]

Olawale et al. (2010) observed that the combination of a questionnaire survey and in-depth interviews was used to provide valuable information in practice in the UK on topics relating to project control. Things such as the degree of execution of project controls, the cost accounting methods most widely employed, the support of software bundles, the extent of cost overruns, the leading inhibiting factors for effective cost control, the reasons for this and the steps that may be used to reduce them have been brought to light. In the United Kingdom, the top five variables inhibiting cost management in construction experience were revealed as concept adjustments, risks and uncertainties; unreliable project time/duration assessment; job sophistication and; subcontractor non-performance. Design change is the single most important factor considered by practitioners as hindering the ability to control construction projects cost. [21]

Memon et al. (2014) discovered that in MARA big building programs, to explore different procurement methods embraced. Results have shown that MARA projects are categorized on the basis of project costs as small and large projects. The contract value project volume over 5 million Ringgit was deemed to be major building contracts. In order to manage projects, traditional and management procurement strategies are adopted. Also, comprehensive study was conducted to identify the factors affecting construction cost performance. Through a questionnaire survey amongst contractor and client personnel, it was perceived that fluctuation of material prices was the most dominant factor affecting construction cost performance followed by cash flow and financial difficulties faced by contractors. Shortage of site workers and lack of communication between parties were found as third major factors affecting construction cost performance. [2]

Neringa et al. (2014) find out factors affecting the success of construction projects in Lithuania were analyzed by grouping them together into seven major categories comprising of external, institutional, project-related, project management/team-related, project manager-related, customer-related and contractor-related factors. A questionnaire was provided to building practitioners and consultants with knowledge of project management and associated expertise. Using the expert judgment process, the study of the information gathered from the survey was carried out. The major factor crucial to the effectiveness of a building project production is the related prior experience of the project management/team. Participants of the survey opined that project management/team related factors such as experience, competence, effective decision making and communication are significant factors ensuring the success of a construction project performance. In contributing to the quality of the construction project results, project-related factors such as project importance, consistent and practical priorities, realistic timeline and sufficient funds/resources and project manager-related factors such as expertise and competence have played a crucial role. Based on the findings of the study it is recommended that more emphasis should be given on improving the human-related or "soft" factors such as experience, competence, effective decision making and communication in order to ensure the success of a construction project performance in the future. The findings would be valuable for future studies in this area. The research would benefit from a larger sample for the questionnaire survey. This would increase the general credibility and wider applicability of the findings. [13]

Alias et al. (2014) identified that project management professionals are expected to aid in reaching unique levels of building efficiency. It will then describe the crucial factors that contribute to project performance and include a forecasting mechanism to help parties to easily determine the likelihood of a good project from their point of view. This further develops a methodological basis for the determination of essential success factors in project management activities based on five (5) project progress variables, which should be taken into account during the phases of project management from the beginning to the end of the project to maximize project success. Thus, the context of the critical success factors (CSFs) to be considered when examining project management practices and project outcomes. Finally, it is hoped that this study will beneficial to all parties involved in construction industries and would stand as a good basis for future research. [28]

Olukyode et al. (2015) observed that Cost of materials and additional works have the highest relative relevant index when comparing all the building cost factors analyzed in this analysis and are the most critical factor affecting construction costs in Nigeria. This is in line with the effects of the variables leading to the cost of construction in Saudi Arabia. Material price variations also have a very powerful impact on building costs. It was ranked second among the major variables. After they analyzed the reasons responsible for project delays and construction cost inflation in Nigeria, he came to the same conclusion. In conclusion, as the three main players in the building industry assume, the predominant factor driving construction prices is the cost of materials. Since Quantity Surveyors are expense consultants, they are in a special position to analyze these variables and take care of calculating and minimizing the adverse impact on the project cost of these variables. Client, contractors and consultants should be able to recognize the prevailing factors contributing to high construction costs in Nigeria and apply the solutions provided to mitigate them in order to regain consumer confidence in consultants, low investment losses, and generally improve the competitiveness and profitability of the sector. [20]

Kissi et al. (2016) observed that in the construction phases, cost planning activities have been prominent and, as such,
unavoidable. The growing worry among stakeholders who are unhappy with the monetary side of the process is looking for a more creative way to spearhead a productive regime that will be devoid of unnecessary costs, most of which are calculated at around 50% of the actual estimate. While it is important to explore the crucial obstacles to cost planning activities in the building industry, there is a need for an efficient cost planning regime, which is the basis for this. Therefore, the focus of this research was to explore the crucial obstacles to cost planning activities that are successful. By using principal component analysis as the primary methodological method, this research exposes four key crucial obstacles to the cost planning process in the construction industry. These four challenges included: a limited information base for cost forecasting, poor cost databases and comprehension, insufficient designs and planning and external circumstances. In view of these findings and the increasing understanding of achieving value for capital, government should build a more desirable economic climate in which standardization and control are exposed to changes in commodity prices. Furthermore, it is proposed that building professionals should be conscious of the increasing pattern of professionalism in which clients are involved in investing within their intended investment portfolio. To this degree, organizations within the fraternity of the built environment, specifically the Ghana Institution of Surveyors, should provide their members with more avenues for cost planning learning processes by continuous professional development platforms as well as updating their expertise. [11]

Vasista et al. (2017) observed that high-quality deliverables will improve competition in the customer-focused model, grow market share and provide a foundation for long-term relationships with owners. However, in most situations, the lack of objective data makes it impossible for administrators to determine the actual state of technical output dependent on quality, since one of the critical success indicators for determining the success of a building project is quality; there is no realistic guidance for evaluating such intangibles. They stated to calculate and evaluate the cost of quality in order to show the measurement of professional success in project management in building projects. From a cost viewpoint, quality costs can play an intermediate role in project successful. By using principal component statistical approaches and software-based models, and well-defined cost reduction strategies, an integrated project cost management framework could be developed. Projects would not be acceptable in terms of benefit if costs are not adequately measured during the tendering process, no matter how good the cost management is. Often, if expenses during the building process are not adequately budgeted and controlled/monitored, however detailed the figures are, the financial effect will be devastating for the contractors. In order to get an ideal project cost and to have leverage over the cost anomalies, better knowledge of its omnipresent inaccuracy and danger in decision-making is needed. [4]

Dr. Divakar et al. (2018) the goal was to enhance the process of cost management in the construction industry by resolving the factors hindering the process of cost management. After statistical analysis, the final factors obtained as described above. All the factors mentioned are crucial factors contributing to the inability to complete the project within the budget specified. The following are the recommendations to be followed in every construction projects to effectively implement cost management process and to avoid frequent budget overruns. 1. The project manager and all construction stakeholders must have gained an understanding of the purpose of the project, decided on priorities, chosen the best course of action to accomplish the goals, identified a detailed job breakdown structure, and analyzed project uncertainties. 2. Relationship between management /client and consultant should be improved and to be established well, by conducting frequent meetings to avoid claims and disputes. 3. The actual budget should be properly and frequently updated. 4. The clients should pay special attention to minimize changes in order during construction so as to avoid delays and cost overrun. [9]

Kumbhani et al. (2018) analyzed all the key factors contributing to cost overruns and determination of the crucial factors in the management process of construction. In almost all building projects, cost accounting is considered to be a significant concern. While a certain degree of effort is paid to prevent cost overruns, poor management strategies are responsible for this. They find out the various reasons that leads to cost overrun and also to some of the key reasons that directly influence the cost overrun. [14]

Bavadekar et al. (2020) in general, pointing out core deficiencies in the cost management practice of construction projects can be due to inadequate approaches to the recognition, management and regulation of client demands, project scale and project cost, incompetent competitiveness in
the bid, delays in construction and equipment, rework, design and specification revisions, scope changes, design mistakes, insufficient preparation, project completion delays, contractual grievances, site conflicts and bad project management, market increases, inflation, rising wages and inventory costs, poor organization of the site and poor communication. In addition, it was discovered that the issue concerned not only the methods to be used, but also the lack of understanding of the techniques, poor cost management process implementation, poor site coordination and insufficient monitoring. Contractors should also consider cost management functions correctly and in a balanced manner. Using a suitable procurement approach, different low-cost components, statistical approaches and models based on well-defined software and cost control techniques, an integrated project cost management system could be developed. If the costs are not accurately estimated during the bidding phase, no matter how efficient the cost control is, the projects will not be satisfactorily realized compared to the profits. Furthermore, if costs are not recorded in the financial statements and adequately controlled/controlled during the construction phase, however accurate the estimates may be, the financial result can be disastrous for contractors. A better understanding of their omnipresence of inaccuracy and risk in decision making is needed to obtain an ideal project cost and to have control over cost deviations. [25]

III. CONCLUSION

Management contracting system was employed on higher-cost buildings and projects with higher complexity and faster building rates, yet a significant number of these projects were found to be completed on time and within the estimated budget, and the client was satisfied. Problem is actually not only in the techniques to use but rather the lack of knowledge of the techniques, the poor management of the cost control methods, and poor site organization and inadequate supervision.

IV. REFERENCES


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