

Comparative Cost Analysis and its Effective Management in Construction

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Abstract-Construction field is the most embracing and Unique area when compared to any other fields in the Present era. The major factor or the source which is essential for the function of any work in the construction is the cash or funds which can be commonly said as Cost. The variations in the cost affect the quality and quantity of the materials which are to be used in the construction. This project deals with the analysis of the costs of 4 major constructions which comprises of both the Indian and the Global constructions in which the data collection is through a Questionnaire comprising the cost details of the construction. The Questionnaire data is then collected and assembled by preparing a cost sheet which consists of the Direct and the Indirect cost details of the constructions. From the details gathered by using the Cost sheet, an analysis of the costs is to be done by using MS- EXCEL software thereby preparing a graphical representation from which the cost details and overrun can be easily depicted. The analyzed results provide the causes for the overrun, the materials and the methods which are responsible for the cost overrun. Such causes and the methods can be rectified in the Indian Construction thereby improving the quality through the effective management in construction.

Keywords: Cost Overrun, cost analysis, MS-EXCEL, Cost sheet.

I. INTRODUCTION:

Construction cost overrun is a common problem in construction industries. The objective of this research is to extract the key cost-influencing factors with new concept and methods to help control the expenditure [1]. Cost estimation is the most important preliminary process in any construction project. To implement this survey, the proposed and applied methodology consists of two parts. The first part concerns the data collection, for which the related journals are chosen as a source for the surveyed proposals. The second part concerns the analysis of the proposals[2].

The economic impact of a construction cost overrun is the possible loss of the economic justification for the project. A cost overrun can also be critical for creating policies within sustainable development on the basis of economic costs. The financial impact of a cost overrun results also in demand for construction investments credits. The paper presents a case of construction cost analysis for wooden energy efficient house that meets sustainable aspects. Analyzed object is characterized by high costs of the construction investment, that result from specific characteristics of the construction output (energy efficient wooden house). In the result of analysis of the construction investment costs for the efficient wooden house and its comparison with the costs of traditional construction investment on maintenance costs, it can be stated that additional cost resulting from the energy efficient house building is higher than costs of traditional construction investment (about 10%) and it can be treated as the investment in the energy efficient house solutions since it brings savings for home expenditures (5% annually).

Like other countries, construction industry in India is also facing a lot of challenges such as the delay to complete the project in time, the expenditure exceeding the budget, the building defects and over dependent of native workers. The ultimate effects of project delay also results in exceeding cost. This leads to serious need of addressing the critical issue of construction cost overrun. To avoid construction cost overrun, very first and most important step is to identify and understand the causes and factors responsible for that. Hence, this paper is aimed to identify various factors responsible for construction cost overrun. Through a comprehensive study of literature review, common factors causing cost overrun resulting in identification of 78 factors were mapped in frequency table. A questionnaire survey and interviews were carried out amongst selected experienced personnel for expert opinion to identify the significant factors causing cost overrun in Malaysia. Five respondents were selected from each of the respondents groups including client, consultant and contractor. The questionnaire responses were analyzed by average index method, which resulted in identification of 59 common fact causing construction cost overrun in India. Results show that poor design & delays in Design, unrealistic contract duration & requirements

imposed, lack of experience, late delivery of materials & equipment, relationship between management & labor, delay preparation & approval of drawings, inadequate planning & scheduling, poor site management & supervision and mistakes during construction were most common and significant factors causing cost overrun in Indian construction industry[3].

Nega (2008) strictly said that the cost variance affects a whole construction industry and give negative impacts towards the national economy of the country. It has resulted the construction projects into big troubles such as project abandonment, reputation damage, inability to secure project finance and may influence the whole life cycle cost of the projects. Otherwise, the cost variance also may affect the construction practitioners such as contractor, consultant, and client. For contractor, it may affect their company cash flow, minimize the chances of winning upcoming projects, lead to huge losses of the profits and may decrease quality of the production in managing projects. Meanwhile, to the consultants, cost variance implies the inability to provide the best value of money to the clients and result in loss of the confidence reposed in them by clients. Further, it has significant effects to clients such as increasing of budget thus resulting in less return on investments. Even the project that has been abandoned was completed, it still difficult to satisfy the users due to the low quality of the project. Therefore, it may affect the quality of life for the user. All these problems will undermine the viability and sustainability of the construction industry[4].

This study adopted mixed research method using questionnaire survey and semi – structured interview with experienced construction practitioners that involved in handling cost control in their organizations. The questionnaire gave each respondent an opportunity to identify variables that they perceived as likely to contribute to cost variances by responding on the Liker scale. Also, the respondents were requested to recommend the corrective actions for overcome these critical issues[5].

This paper will explore the issues and challenges that the profession faces both on a regional level and a global scale in gaining greater recognition, improving professional standards and ultimately improving the cost performance of projects around the world. It will conclude with a range of recommendations and strategies to help meet these challenges[6].

II. METHODS

2.1 Literature Review

In order to determine the impact of project change, the relevant literature was reviewed and a case study was done on a civil engineering construction project. The case study comprised the construction phase of a recently completed civil and structural construction project in South Africa, and the data for the case study was obtained from the consulting engineers who designed and managed the project. For the sake of confidentiality, all names of the stakeholders involved in the project have been omitted from this article[7].

To be able to understand the project management environment and the state of change management in practice, the same case study was used and various interviews with project managers were done. The case study was analyzed to understand how project finances were managed, the reasoning behind the particular management approach, its effectiveness, and its shortcomings. To understand how the management of cost and risk, as a result of changes, are currently done in practice, 18 project managers were interviewed. These were mostly directors of consulting firms who are actively involved in the market place. The semi structured interviews consisted of a questionnaire to determine project managers experience and modus operandi in managing the costs and risks of change. The results are reported in this article[8].

There is increasing recognition from project clients and financiers that effective project cost management and control requires the use of highly specialized and expert cost management professionals. The problems with project managers, architects, designers, engineers and other professionals undertaking project cost management as simply a subset of their array of activities are becoming increasingly apparent. This presents tremendous opportunities for expert project cost management professionals but also presents many challenges in terms of the global development of the profession [9]. The construction and infrastructure market is now truly global and major projects are typically undertaken with a range of international participants. This brings together firms and professionals from advanced developed industries and their counterparts from developing industries. The gulf in the sophistication and expertise of service provided between the two is often vast and presents a major challenge is to raise the standards of operators in the developing markets. This applies equally to project cost management and heightens the importance of the development of global project cost management standards, competencies, education and certification/registration programs [10].

2.2 Determination of Cost Variance Factors

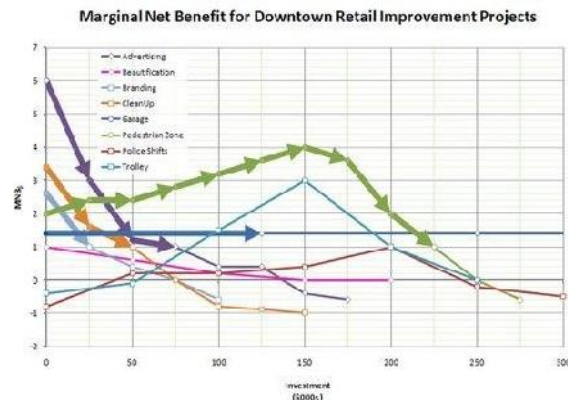
Root causes of variance can be classified in different groups, such as factors related to customers, related factors to

design and factors related to the subcontractors (Love, 2002. Rework assumptions related to the customer is related to design and construction such as design changes are done according to customer demand. Rework factors related to customer include:

A. the lack of experience and knowledge about the manufacturing process b. Lack of funding is needed for the policy making of site. c. The client is not involved in the project d. Summary of things as inadequate e. Poor communication with design consultant's f. Inadequacy of the literature of the contract Factors related to the design include: a. Ineffective use of quality management requirements b. Ineffective use of information technology c. Poor coordination between the various members of the design team d. Timing / fixed time to complete each task e. Poor planning time per worker f. The lack of labor to complete the required tasks g. Time surplus of workers / reallocation of time for other activities, projects h. Stripped down design that makes time not considered sufficient. i. Summary of the literature which is determined related to the customer based on the contract [11].

Factors associated with subcontractors that may cause rework include: a. Weak labor b. inadequate management skills c. The use of poor quality materials d. Problems associated with other contractors and lack of coordination between them e. Changes in construction methods to improve construction processes f. Injuries, defects and errors related to poor construction methods g. Restrictions in many activities and tasks Rework has an important role in the implementation of the project. In fact, the effect of time is considered to repair defects in quality. Eliminate rework want more time to do things right from the beginning. Additional time will cause: a. Contractor accelerates its work and therefore can complete the desired tasks according to schedule. b. Due to the increasing the time, don't reach to the planned day [12].

In both cases, it is necessary that extra cost to speed up or delay the delivery to the customer that in the second case, the effect of defective repair work, is obvious in the cost of contractor quality. The timing of rework compensation related to the failure of building, design errors and other discrepancies of control, reverse effects of rework on time and costs is critical. Systematic literature to review related measurements with subcontractors is essential. According to the above issues, if detailed written not available, large amounts of rework costs (part of indirect



costs) may not be reviewed [13].

The above graph depicts the major factors which are responsible for the cost variance in the construction industries which are undergoing the projects of the equal net worth of the total budget for example: in case of the construction variance factors, the selected constructions must be of the same overall budget costs.

The cost variance factors are hence taken or referred from the literatures or the journals concerning the cost analysis and the factors which affect the cost of the buildings in various areas globally across various countries and nations. Such data are collected and then arranged in a step by step manner in the preparation of the detailed Questionnaire survey.

The data collected in the form of a Questionnaire survey comprises of the data from 25 different literatures from different authors across the world who mainly concerns about the cost factors related to the construction and the factors which are responsible for the cost variance in such construction which tends to affect the overall budget of the construction by direct or indirect means.

2.3 Designing Questionnaire Survey

The questionnaire was tested with a pilot survey for clarity, ease of use and value of information that could be gathered. The questionnaire survey is divided into two parts. The first part consists of general information like type of company, experience value of their project etc. and the second part consists of the construction cost factors for evaluation. The survey questionnaire is designed to probe the cross-sectional behavioral pattern of the construction cost in the construction industry. The questionnaire was prepared for the pilot survey was formulated by seeing the relevant literature in the area of construction cost. The interviewer was free to ask additional questions that focused on issues during the course of interview. The freedom to follow the interview to ask for clarification and the focus on specific projects, cost practices and knowledge made the interviews insightful.

Questionnaires have advantages over some other types of surveys in that they are cheap, do not require as much effort from the questioner as verbal or telephone surveys, and often have standardized answers that make it simple to compile data. However, such standardized answers may frustrate users. Questionnaires are also sharply limited by the fact that respondents must be able to read the questions and respond to them.

The questionnaire survey which is to be given to the reputed companies consists of the Estimation details of the Construction which consists of the cost details of the resources and the work progress. The sample of the questionnaire is given as below.

CONSTRUCTION COST WORKSHEET				
COST CATEGORY	CASH	IN KIND MATERIALS	IN KIND PROF. LABOR	TOTAL
Land Acquisition Cost	₹	₹	₹	₹
Land Acquisition Legal Fees	₹	₹	₹	₹
Land Acquisition Closing Costs	₹	₹	₹	₹
Land Acquisition Title and Recording Fees	₹	₹	₹	₹
Demolition	₹	₹	₹	₹
Site Preparation/ Earth Work	₹	₹	₹	₹
Site Utilities (sewer, water, telephone, electric)	₹	₹	₹	₹
Other Site Improvements (landscaping, fences)	₹	₹	₹	₹
Foundation and Concrete	₹	₹	₹	₹
Rough Carpentry	₹	₹	₹	₹
Exterior Doors, Windows, Glass	₹	₹	₹	₹
Exterior Finishing (siding, stucco, masonry, etc.)	₹	₹	₹	₹
Insulation	₹	₹	₹	₹
Roofing	₹	₹	₹	₹
Finish Carpentry (trim, window/door casing, etc.)	₹	₹	₹	₹
Cabinets, Vanities and Countertops	₹	₹	₹	₹
Interior Doors and Frames	₹	₹	₹	₹
Drywall	₹	₹	₹	₹
Flooring	₹	₹	₹	₹
Painting	₹	₹	₹	₹

The above table describes about the hard costs which are followed in the field of the construction which includes the land acquisition cost, land acquisition legal fee, land acquisition closing fee, Demolition cost, Earthwork, Carpentry and so on. Such cost details must be collected from the construction for further analysis.

Appliances	₹	₹	₹	₹
Plumbing	₹	₹	₹	₹
Heating and Ventilation	₹	₹	₹	₹
Electrical	₹	₹	₹	₹
Other Structure (shed, driveway, garage, etc.)	₹	₹	₹	₹
Special Construction (modification for health and/or access)	₹	₹	₹	₹
Construction Management	₹	₹	₹	₹
Architect Fees	₹	₹	₹	₹
Appraisal Fees	₹	₹	₹	₹
Utilities Fees (water and sewer hookups)	₹	₹	₹	₹
Building Permits Fees	₹	₹	₹	₹
Survey Fees	₹	₹	₹	₹
Home Cost Property Taxes	₹	₹	₹	₹
Home Cost Insurance	₹	₹	₹	₹
Origination Fees	₹	₹	₹	₹
Loan Closing Costs	₹	₹	₹	₹
Legal Fees	₹	₹	₹	₹
Developer / Admin Fee	₹	₹	₹	₹
TOTAL DEVELOPMENT COST	₹	₹	₹	₹

The above table describes the soft cost questionnaire which comprises of the Architect fee appraisal fee, utility fee, Survey fee, legal fee, Origination fee, Building permits fee, Developer/Admin fee and so on.

Additional Information		Project Restricted Cash Donations & Home Sponsors	
	₹	SPONSOR NAME	AMOUNT
Appraised Value	₹ -		₹ -
Sales Price	₹ -		₹ -
Homeowner Downpayment	₹ -		₹ -
First Mortgage Amount	₹ -		₹ -
First Mortgage Term (Months)			₹ -
Monthly Housing Expenses (Property Taxes, Maintenance, Insurance)	₹ -		₹ -
Square Footage			₹ -

The additional fee consists of the sales price, Homeowner down payment, First Mortgage amount, Monthly Housing expense and so on.

The Questionnaire comprising the above details is then send to the reputed companies which comprises of two indigenous companies and two global companies with the project worth of about 50 million Indian currency. The cost details consists of both the direct expenses and the Indirect expenses faced by the company towards the completion of the project.

The questionnaire survey data which are send to the companies are then collected and then made to a single cost sheet which comprises of the entire cost details of the projects and are differentiated into four phases of the cost details. The collected details are used for the preparation of the cost analysis chart.

2.3 Data Analysis and Discussion

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data.

The analysis of the data is performed through the software MS-EXCEL which is a common software and can be performed in simple devices. The analysis process involves the reference of the questionnaire survey results which consists of the cost details of the constructions that is two Indian and two foreign constructions.

The data analysis through the software is depicted as below in the image.

PARTICULARS	INDIA		OTHERS	
	CONSTRUCTION-A	CONSTRUCTION-B	CONSTRUCTION-C	CONSTRUCTION-D
1. Material Cost				
Concrete	5,780,000.00	6,360,000.00	622,534.00	1,383,410.00
Brick	3,045,000.00	4,750,000.00	190,218.00	2,875,115.00
Sand	112,600.00	2,055,000.00	415,023.00	5,187,787.00
Steel	138,600.00	108,500.00	765,660.00	1,027,557.00
Total	9,077,200.00	13,273,500.00	2,023,235.00	9,683,869.00
2. Labour Cost	8,095,300.00	700,800.00	1,363,847.00	5,568,225.00
3. Indirect Cost				
Fuel	1,465,000.00	1,235,000.00	518,778.00	1,027,557.00
Electricity	1,095,000.00	1,885,000.00	726,290.00	765,599.00
Repair & Maintenance	885,800.00	838,500.00	2,318,753.00	3,769,792.00
Rem Paid	2,800,000.00	2,500,000.00	870,846.00	345,852.00
Transportation	550,000.00	475,000.00	3,106,239.00	1,694,877.00
Total	7,555,800.00	6,333,500.00	7,495,106.00	7,613,387.00
4. Miscellaneous	27,858,300.00	2,388,500.00	1,675,682.00	415,023.00
TOTAL	52,496,600.00	23,296,100.00	12,918,070.00	25,280,504.00

The above table depicts the analysis of the construction using the software MS-EXCEL in which the construction are divided into construction A, B, C and D.

Where, Construction A and B are Indian constructions and Construction B and C are foreign constructions.

The common aspect in the above constructions is that, all the constructions selected for the data analysis does have a total expense of about 50 million Indian rupees.

The Graphical representation of the data analysis are depicted as below,

The figure 2.4.1 describes the Material cost of the constructions A, B, C and D.

The material comprises of the brick, cement, aggregates, formwork and so on which are needed for the construction of the projects. It shows a great variance in the material costs of the construction since the foreign constructions shows a greater chance of using the advanced technologies.

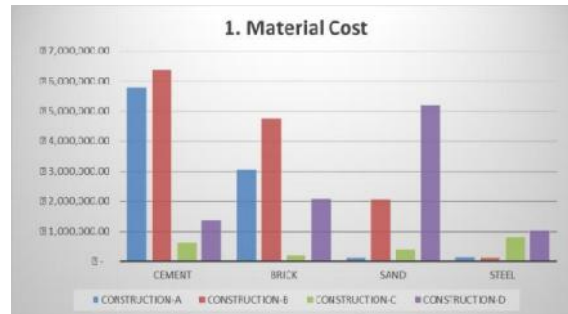


Fig.2.4.1 Material cost in graphical chart

The Graphical representation of the Labor costs is represented as below,

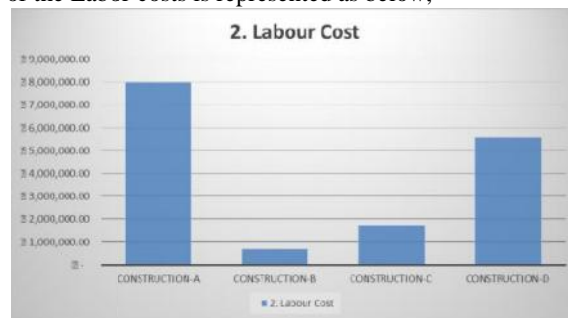


Fig.2.4.2 Labor costs in Graphical chat

The figure 2.4.2 represents the Labor cost details depicted in the Graphical representation in the construction A, B, C and D.

The Graphical representation of the miscellaneous expenses are depicted as below,

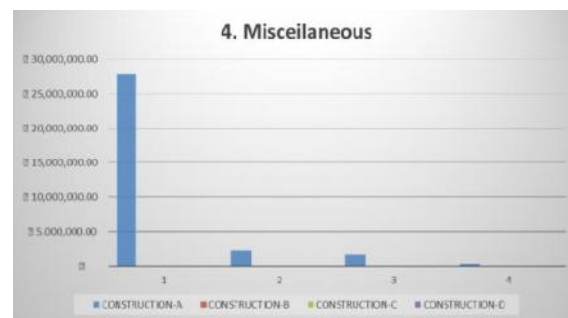


Fig.2.4.3 Chart representing the miscellaneous expenses

The figure 2.4.3 represents the Miscellaneous expenses in the constructions A, B, C and D which shows a greater difference in the cost details.

2.4 Conclusion and Recommendation

The Results of the Analysis hence provides a data over the cost details of the construction projects. By using the results, the most efficient mode of cost effectiveness could be determined and thus suggested to the reputed companies from which the Questionnaire survey has been carried out. This leads to an cost effectiveness in the field of Construction. The overall result of the analysis states that, the replacement of the materials and methods with the foreign utilities reduces the construction cost of the Indian construction by 20% of the overall cost.

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