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A STUDY ON FACTORS AFFECTING ESTIMATION OF CONSTRUCTION PROJECT

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Abstract - Construction industry is considered as a very important sector for development in all over the world and the construction cost estimation is the most important element in it. Realistic estimation of construction cost is essential for both successful planning and completion of every construction project. The key factor for a successful project is the accurate cost estimation at its early stage. It is very difficult to quickly and accurately estimate construction costs at the planning stage itself when project information is limited. This study aim at caring out to identify the factors affecting construction cost estimation. The factors were identified based on questionnaire survey. Questionnaires were given to 64 experts in the construction industry aims to determine the importance of construction cost estimation and to determine the score of each factor. Statistical analysis will be carried out on the feedback of the respondents of the survey. RII value of the factors to be found using Microsoft Excel. The mean score of each factor to be determined and the p-value was calculated using the SPSS software. The significance of each factor used in the questionnaire to be determined. The important factors were identified using the mean score and their p-value.

***Key Words*: Cost estimation, Questionnaire preparation, SPSS**

1. INTRODUCTION

Several factors affect the accuracy of building project's cost estimation which must be considered at the early stage of the estimation process. Some factors can rapidly increase the estimated costs and the possibility of contractual strifes between the various parties involved. There are other factors that can help the estimator to decrease the unnecessary cost of an item and thus lead to successful tendering in a very competitive market. Therefore, for accurate estimating detailed study of the biding documents and the environmental situation are required. In order to arrive to the most accurate estimate of the probable cost consistent with the bidding time available and the accuracy and completeness of the information submitted, it also requires careful analysis of data of all projects.

Realistic estimation of construction cost is essential for both successful planning and completion of all construction project. Also due to uncertain conditions, valid cost forecasts become an significant source of information for decision making by all construction parties. Accurate cost estimation at the early stage of a construction project is a significant factor in a successful project. But it is very difficult to quickly and accurately estimate construction costs at the planning stage, when drawings, documentation and the like are still incomplete. As such, numerous techniques have been applied to accurately estimate construction costs at an early stage, when project information is limited. While the numerous techniques have their pros and cons, thus there must be a little effort made to determine the best technique in terms of cost estimating performance. The purpose of this paper is to find the important factors affecting the cost estimation of construction projects.

1.1 OBJECTIVES

- To explore the existing common practices in cost estimating.
- To identify the significant factors affecting the construction cost.

2. LITERATURE REVIEW

Aftab et.al., (2010) mentioned that the personnel of Project Management Consultant (PMC) ranked ineffective planning and scheduling by contractors as quite significant factor affecting construction cost. This issue seems to be true as it is highly related to cash flow and financial difficulties faced by contractors.

Chimwaso K.D. (2001) mentioned that design changes, inadequate planning, unpredictable weather conditions and fluctuations in the cost of building materials are common factors causing cost overruns.

Collier K (1987) emphasized the importance of the demand for construction works. He stated that: "It would be wrong to give the impression that all estimates and bids for construction work are made up of costs of labors, materials, equipment, job overhead costs, and operating overhead costs. All estimated from determined facts and calculated probabilities, and with a profit margin precisely computed according to current economic indicators". He added**;** "there are other things that at times may have a greater influence on the amount of a bid than any variations of those costs and the most important of these is the demand for construction work".

Harvey J (1979) has analyzed the "time" effect in relation to several of the other factors. Using dummy variables for "years", she found no significant interaction effects with the

number of bidders or geographical location but a significant interaction effect with project size and the three-way interaction of number of bidders/project size/ years.

Huawang Shi et.al., (2014) Construction cost estimation and prediction, the basis of cost budgeting and cost management, is crucial for construction firms to survive and grow in the industry. The objective of this paper is to present a novel method integrating rough sets (RS) theory and an artificial neural network (ANN) to forecast construction project cost. Because there are many factors affecting the cost of building and some of the factors are related and redundant, rough sets theory is applied to find relevant factors to the cost, which are used as inputs of an artificial neural-network to predict the cost of construction project. Therefore, the main characteristic attributes were withdraw, the complexity of neural network system and the computing time was reduced, as well. A case study was carried out on the cost estimate of a sample project using the model.

Khaled Hesham Hyari et.al., (2015) Cost estimation for public projects includes, but is not limited to, construction costs and engineering services costs. The available cost estimation models for these projects focus on the construction phase, with little or no consideration given to engineering services. This paper presents an artificial neural network model for the conceptual cost estimation of engineering services for public construction projects that considers both design costs and construction supervision costs. In developing the model, the authors first identify the factors that influence the cost of engineering services, and then apply a suitable artificial neural network for a cost estimation model. The model predicts the cost of engineering services as a percentage of construction cost based on project type, engineering services category, project location, and project scope.

Li Liu et.al., (2010) Central to cost-based competition is the capability to accurately predict the cost of delivering a project. Most literature on cost estimation focuses on specific estimation methods as generic techniques and little attention has been paid to the unique requirements at each project stage. This note attempts to identify the critical factors for effective estimation at various stages of typical construction projects. Drawing from organization control theory and cost estimating literature, this note develops a theoretical framework that identifies the critical factors for effective cost estimation during each project phase of a conventional construction project.

Muhammad T. Hatamleh et.al., (2018) Cost estimating process is an important element within the project life cycle. Comprehensive information, expanded knowledge, considerable expertise, and continuous improvement are needed to obtain accurate cost estimation. The purpose of this paper is to identify the critical factors that affect accuracy of cost estimation and evaluate the degree to which these factors are important from contractors' and consultants' viewpoints. Qualitative and quantitative research approaches were adopted in collecting and analyzing the data, and testing the hypotheses. Based on the literature review, a questionnaire was prepared and then was modified according to the results of face-to-face open-ended interviews conducted with 11 project managers. The final version of the questionnaire was distributed to a random sample of 265 respondents. For analyzing the collected data Kendall's and Mann-Whitney tests were conducted. The analysis revealed that there is a strong agreement between contractors and consultants in the ranking of the factors related to consultant, contractor, design parameters, and information. A slightly weak agreement between contractors and consultants was noted regarding the factors related to market conditions (external factors) and factors related to project characteristics. Furthermore, the results show that the top ten factors affecting the accuracy of cost estimate are clear and detail drawings and specification, pricing experience of construction projects, perception of estimation importance, equipment (cost/availability/ performance), project complexity, clear scope definition, accuracy and reliability of cost information, site constraints (access, storage, services), material availability, financial capabilities of the client, and availability of database of bids on similar project (historical data).

Neufville et.al., (1977) analyzed data on all new construction costing over $100,000 by the Commonwealth of Massachusetts Bureau of Building Construction from 1961 to 1974. The data included 167 contracts valued at over $900,000,000 in total (or $1,332 billion in 1974 dollars). Their analysis showed a curved negative relationship between low bid/engineers' estimate ratios and the number of bids received. This trend still appeared to hold in .good years and "bad years".

Strandell M (1978) emphasized the importance of productivity in construction. He stated that: "There is general agreement by owners, engineers and contractors that productivity in the construction industry is a problem worthy of serious study. There is no question as to its effect on the cost and time involved in completing a constructed facility."

Uppal K.B. (1997) considers that cost estimation is the determination of quantity and the predicting or forecasting “within a defined scope” of the costs required to construct and equip a facility, to manufacture goods, or to furnish a service. In conclusion, cost estimating is the means of forecasting and foreseeing the future costs of a construction project before it actually exists. However, the final project cost will not be known until the construction is finished and facility is operated.

Wilson et.al., (1987) provide a diagram of their summarized data which indicates a curved negative correlation between the low bid/estimate ratios and the number of bids. This trend exists for each of their four groups of data studied although the larger contracts have a shallower curve. The smoothness of the curves connecting the medians on accuracy improved only slightly with the

increasing number of previous bills used with no improvement observed with the use of more than three bills.

3. RESEARCH METHODOLOGY

The methodology for this project proceeds as follows:-

[1] Literature collection
[2] Review of literature
[3] Identification of factors
[4] Questionnaire preparation
[5] Questionnaire survey
[6] Analysis of data
[7] Recommendations

The research conducted in this study is mostly exploratory in nature. This research, and data has been obtained through primary avenues – desk research and questionnaire. The factors are listed below:-

Table 1: FACTORS AFFECTING BUILDING COST

Time / Cost related
1. Importance for project to be completed within budget
2. Importance for project to be delivered
3. Time given to consultant to evaluate bids
4. Extent to which contract period is allowed to vary
5. Importance for project to be completed on time
6. Bidding environment
7. Consultant's level of construction sophistication
8. Owner's level of construction sophistication
Parties experience related
1. Consultant experience with similar project
2. Owners experience with similar project
3. Consultant staffing level to attend to contractor
4. Owners staffing level to attend to contractor
5. Contractor's experience with similar type of projects
6. Contractor's experience with similar size of projects
7. Contractors experience with project in location
8. Subcontractor experience and capability
9. Communication among project team
10. Contractor's prior working relationship with the owners
11. Contractor prior working relationship with consultant
12. Contractor track record for completion on time
13. Contractor track record for completion on budget
14. Contractor track records for completion on quality
15. Contractor staffing level
16. Adequacy of contractor plant and equipment
17. Magnitude of change orders in contractor past project
Financial issues
1. Periodical payments
2. Inflation pressure
3. Economic instability
4. Uncertainty of taxes
5. State of market
6. Accuracy of estimated financing cost
7. Currency exchange fluctuation average
8. Availability of management and finance plans
Bidding situations
1. Number of competitors
2. Level of competition
3. Time between project announcement and bid opening average
4. Accuracy of bidding documents provided by client
Project Characteristics
1. Type of contract
2. Size of contract
3. Project location
4. Site condition
5. Competent and leadership of project manager
6. Experience and incentives of field staff
7. Quality of firm's project planning and management
8. Labor and equipment required
9. Content of the project specifications
10. Punitive damages
11. Arbitration clause
12. Knowledge of client and consultant average
13. Attitude towards changes
14. Environmental issues
15. Impact of project schedule
16. Quality of specification code
17. Unforeseeable change in local laws and procedures
18. Weather
19. Nationality of labor
20. Social and cultural impact
21. Religious regulations
22. Estimating method
23. Public exposure
Estimating Process
1. Availability of productivity standards
2. Availability of cost indexes average
3.Relevant experience of estimating team
4. Ability of estimating team
5. Standard procedure for updating cost information
6. Method used in determining contingency

4. QUESTIONNAIRE PREPARATION

A questionnaire was designed based on the objectives of the study, which are causes of building cost estimation. A questionnaire survey was developed to get the opinion and understanding from the experienced respondents regarding to the cost estimating problem. The questionnaires are all classified into 2 sections:

- **SECTION A:** Company and respondent profile
- **SECTION B:** Factors affecting building cost

Based on the literature and factors considered, a questionnaire was designed. The above mentioned factors were adapted to measure factor affecting in construction project.

5. CONCLUSIONS

Different views of various authors on cost estimation were discussed. Based on these information obtained from literature search, seventy two factors were identified and used for the study. The study gave the six most important factors and they are: Design related factors, Time or Cost related factors, Parties experience related, Financial issues, Bidding situations, Project Characteristics, Estimating Process. Therefore the major conclusion is that cost overrun in building construction is still a adverse problem due to various known reasons and thus, there is an urgent need for developing an advanced cost in building construction that should yield better result.

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