

An Assessment of Factors Affecting the Accuracy of an Early Cost Estimate for Repetitive Projects

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Abstract: *Today's era Indian construction industry is experiencing a rapid boom with enormous demand of infrastructure facilities. This huge demand results in the completion of projects with shorter duration and most economical manner. For this, project management tools (planning, scheduling, monitoring, controlling) plays vital role in the project time line. The early cost estimate is the proposed estimated cost of project that is calculated in the planning stage of the project. This acts as the key ingredient in the project's funding. The accurate estimation of an early cost estimate is very important to the sponsoring organisation as well as project team. The performance and overall success of the project team is measured by how well the actual cost compares to early cost estimate. Understanding the importance of repetitive projects, accuracy of the early cost estimate, this paper is aimed to identify the various factors that are potentially affecting the early cost estimate of the project and their impact on the accuracy of early cost estimate.*

Keywords: Early Cost Estimate, Repetitive Projects, Accuracy of Cost Estimate

1. Introduction

This study is based on a fundamental component of project namely estimating, which directly and indirectly affects the cost of project. The study consists of identifying the various factors that are potentially affecting the early cost estimate of the project and their impact on the accuracy of early cost estimate. As the scope of construction industry is widening day by day, the scope of this study is focused on repetitive type of construction projects to increase the outcome achieve economy with quality and durability.

Objectives: By knowing importance of Estimate accuracy, the paper is aimed to find importance of each element to evaluate uniformity, quality and accuracy of Early Cost Estimate.

2. Literature Survey

Steven M. Trost etc. al. (2003) found the importance of accurate estimates during the early stages of capital projects. Early project estimates represent a key ingredient in business unit decisions and often become the basis for a project's ultimate funding. Garold G. Oberlender etc. al. (2001) was suggested that accuracy of an early cost estimate is measured by how well the estimated cost compares to the actual total installed cost. They found that accuracy of an early cost estimate depends on four determinants: (1) who was involved in preparing the estimate; (2) how the estimate was prepared; (3) what was known about the project; and (4) other factors considered while preparing the estimate. Adnan Enshassi etc. al (2013) studied on factors affecting the accuracy of pre tender cost estimates in GAZA strip. They studied that Pre-tender cost estimates of construction projects require extensive knowledge and expertise. They aimed to identify, evaluate and rank essential factors affecting the accuracy of pre-tender cost estimating from the perspective of clients and consultants. Polycarp Olaku Alumbugu etc. al (2014) have noticed that accurate cost

estimates are crucial to the effective realisation of construction projects & the presence of inherent inaccuracies in the bill of quantities prepared by estimators. Seokjin Choi etc. al. (2014) studied that early cost prediction is often inaccurate because public officials are not familiar with cost engineering practices and moreover, have limited time and insufficient information for estimating the possible range of the cost distribution. They developed a conceptual cost prediction model by combining rough set theory, case-based reasoning and genetic algorithms to better predict costs in the conceptual planning phase.

3. Methodology

To find importance of each element to evaluate uniformity, quality and accuracy of an early cost estimate, the well designed questionnaire was used to evaluate importance of each element to evaluate uniformity, quality and accuracy of Early Cost Estimate and again processed through statistical method of Relative Importance Index (RII). By the following formula:

$$RII = \frac{\sum w}{A * N}$$

Where;

W= weight of each factor given by the respondent in the range of 1 to 5

A= highest weight in the scale

N= total number of respondent

Well designed questionnaire was constructed on the basis of literature review. Total of 40 elements were made and then classified into six groups each named as Elements related to client characteristics, Elements related to Consultant, Elements related to project characteristics, Elements related to contract requirements & Contractors, Elements related to market condition and Elements related to procedure for estimate. (The Questionnaire sheet is shown in Appendix)

This questionnaire was distributed into 35 extensive construction projects. Each element was rated on the five point likert scale where one representing the worst and five representing the best possible. The well collected data then processed for Relative Importance Index (RII) calculation. The software tool used for calculation is MS Excel. The calculated RII is shown in **Table. I**

4. Results & Discussion

By observing the calculated Relative Importance Index (RII) it is clear that the least RII calculated is 0.5550 (Element no. 23 & 30). This derives that every element included in the scores sheet is given importance above average level but the extensive analysis of the calculated RII gives that top 10 elements with highest importance index as follows:

1. Client's Level of experience
2. Level of skill & experience of consultant
3. Financial capability of client
4. Level of quality drawings & workmanship
5. Clients policy for award & payment
6. Use of technology & process in project
7. Quality of assumptions made & utilisation of checklists during preparing the estimate
8. Completeness of project documents
9. Proper documentation of project information & standard estimate procedure defined formerly
10. Build ability of design.

The five least important factors evaluated by respondents are Social Cultural & weather effects, Size of estimating team, Impact of team integration & alignment, Method of selection of tender, Level of competition in bidding.

5. Conclusion

The order of ranking concludes that client's financial capability, skill and experience affects more to the accuracy of an early cost estimate. It is also seen that the results are given more importance than the procedure as the elements related to procedure of estimate are rated relatively lower. It is recommended that procedure is also to be given equal importance as compared to skill & experiences to improve the accuracy of an early cost estimate in construction projects.

6. Future Scope

As it include study of major element of project i.e. Cost Estimating. It is assumed that this study can contribute to the

construction industry especially in the sector of Construction Management. The success of project is highly correlated with the accuracy of scheduling and cost estimating in the planning stage of the project. Hence, it is important to focus on this fact of construction project. The knowledge of this paper will also help to estimators and planning engineer to work for the successful project completion.

References

- [1] Garold D. Oberlender, and Steven M. Trost, "PREDICTING ACCURACY OF EARLY COST ESTIMATES BASED ON ESTIMATE QUALITY" Journal of Construction Engineering and Management, Vol. 127, No. 3, May/June, 2001.
- [2] Steven M. Trost, M.ASCE,1 and Garold D. Oberlender, "Predicting Accuracy of Early Cost Estimates Using Factor Analysis and Multivariate Regression" Journal of Construction Engineering and Management, Vol. 129, No. 2, April 1, 2003.
- [3] Adnan Enshassi, Sherif Mohamed and Munther Abdel-Hadi "Factors Affecting the Accuracy of Pre-Tender Cost Estimates in the Gaza Strip" Journal of Construction in Developing Countries, 18(1), 73-94, 2013
- [4] Seokjin Choi, Du Y. Kim, Seung H. Han and Young Hoon Kwak "Conceptual Cost-Prediction Model for Public Road Planning via Rough Set Theory and Case-Based Reasoning" Journal of Construction Engineering and Management, Vol.140, January 2014
- [5] Polycarp Olaku Alumbugu , Wasii Adeniran Ola-awo SAIDU, Ibrahim ABDULLAHI, Mustapha Muhammed and Abdulmumin Abdulazeez "Assessment of the Factors Affecting Accuracy of Pre-tender Cost Estimate in Kaduna State, Nigeria" IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT) Volume 8, Issue 5 Ver. IV (May. 2014), PP 19-27

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Table 1: Ranking of Elements from Relative Importance Index (RII)

Element No.	RII	Rank	Element No.	RII	Rank	Element No.	RII	Rank	Element No.	RII	Rank
1	0.700	3	11	0.615	28	21	0.620	27	31	0.565	36
2	0.730	1	12	0.660	17	22	0.625	24	32	0.665	15
3	0.645	20	13	0.690	6	23	0.555	39	33	0.675	12
4	0.655	18	14	0.620	25	24	0.615	29	34	0.605	32
5	0.690	5	15	0.625	23	25	0.595	33	35	0.560	37
6	0.725	2	16	0.620	26	26	0.610	30	36	0.560	38
7	0.670	13	17	0.590	34	27	0.650	19	37	0.645	21
8	0.660	16	18	0.585	35	28	0.605	31	38	0.645	22
9	0.680	8	19	0.695	4	29	0.670	14	39	0.690	7
10	0.675	10	20	0.675	11	30	0.555	40	40	0.680	9

Appendix

Please rank/rate each element included in the Score Sheet table below according to their individual importance for the Accuracy of an Early Cost Estimate.

Questionnaire with score					
Sr. No.	Elements	Worst			Best
		1	2	3	4
Elements related to Client Characteristics					
1	Financial capabilities of client				
2	Client's Level of experience				
3	Type of client (Govt, NGO,PVT etc)				
4	Clear definition of scope for client				
5	Client's policy for award and payment				
Elements related to Consultant / Design parameters / Design info / Data					
6	Level of skill and experience of consultant				
7	Applicability, reliability & completeness of cost estimate				
8	level of available historic data for similar project				
9	completeness of project document				
10	Build ability of design				
11	Work load of consultant during estimation				
Elements related to Project Characteristics					
12	Type & capacity of project				
13	Use of technology & process in project				
14	Project site constraints				
15	Project Characteristics (Time, design, difficulty etc)				
16	Impact of project planning and scheduling				
Elements related to Contract requirement, Procurement method & Contractor					
17	Type of contract & its impact				
18	Bidding climate & competition				
19	level of quality drawing, definition, & workmanship				
20	Clear contract conditions				
21	content of disputes / risks resolution methods				
22	Capacity of contractor(financial, managerial, technical etc)				
23	Method of selection of tender				
24	Amount of special works				
25	Taxes and other financial requirements				
External Elements and Market conditions					
26	Impact of government requirements				
27	Work force & labour productivity				
28	Currency exchange, Taxes & Insurances				
29	Elements related to resources (Material and equipment) (Availability, cost, supply and performance)				
30	Level of competition in bidding				
31	Social cultural & weather effects				
32	Experience of estimating team members				
33	Level of involvement of PM & other resources				
34	Purpose & use of estimate and review by appropriate party				
35	Size of estimating team				
36	Impact of team integration & alignment				
Elements related to Procedure for estimate					
37	Standard procedure for updating costs information				
38	Method of estimate used & time allowed for it				
39	quality of assumptions made and utilization of checklists during preparation of estimate				
40	Proper documentation of project information and standard estimate procedure defined formerly				