

Understanding stakeholders' perspective of cost estimation in project management

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Abstract

Cost overrun is a chronic problem across most projects. While a significant research have been published on this topic, the understanding of the root causes and a clear direction towards improvement remained unexplored. The focus of the past research is mainly on the factors directly or indirectly associated with the project environment and their relative impacts on overall cost performance in projects. In contrast to such traditional approach, this research aimed to establish a conceptual model by identifying the underlying issues associated mainly with the perceptions of the board stakeholders involved over entire lifecycle of projects. Based on a structured interview with a few selective organisations, data was collected and a few rich pictures were developed over every phase of project development. By employing the soft system methodology, the rich pictures were later transformed into the concept models for potential establishment of a new body of knowledge in the field. Among the findings, it has been revealed that at the project inception stage, political and legislative factors play significant roles in the business case development. Statutory compliance and environmental issues are perceived to be critical in influencing cost performance in projects. The resulting concept model on cost overrun is expected to fill a significant knowledge gap in cost estimation practice across all industry sectors.

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1. Introduction

A research report focusing on the failure of software projects highlighted a survey where almost one third of sampled projects experienced cost overruns of 150–200%, with an average overrun of 189% of the original cost estimate. Over one third also experienced time overruns of 200–300%, with an average overrun of 222% of the original time estimate (The Standish Group Report, 1995). Similarly, there is a strong consensus among construction industry professionals that the traditional cost estimation approach does not work (Yeo, 1989, 1990; Robinson, 1986). Due to increasing interest among the stakeholders from project owners and suppliers to end user and facility managers in modern construction projects, accurate estimation of cost budgets is a difficult task. Many times there is

neither enough data nor adequate time and resources available to prepare an accurate cost estimate. Even when the cost estimate is done correctly, the senior management may determine that the costs are too high resulting in cost reductions without a corresponding reduction of the project scope. Senior level management traditionally provides a top-down cost estimate starting with an understanding of how much there is to allocate to a given project. Unfortunately, the consequences of cost overrun are often borne by the end users (or the public) by way of imposing extra margins on the services delivered. This is particularly evident in the operation of social and economical infrastructure projects delivered through Public–Private-Partnerships (PPP) or Private Finance Initiatives (PFI) across many countries including Australia and the UK.

The above factual evidence clearly shows a gap in current cost estimation practices across the board and highlights the need for reconsideration and potentially re-establishment of a concept model. To this effect, the main objective of the research entails understanding the changes of project environment and

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the emergence of complexity in cost estimating processes in order to assess their impacts on society and the economy and devising strategies for realistic cost management. A conceptual model has been developed by integrating existing and new knowledge in risk management, cost estimating and management processes in projects. By applying the soft system methodology (SSM), cognitive mapping of the decision makers for better understanding of the pathways and potential coping mechanisms for realistic cost planning and controlling practices have been captured (Checkland, 1981; Winter, 2006). The resulting concept model is expected to provide hands-on training to relevant professionals for the capacity building on the improved cost estimating processes across the industry.

2. Background review

Cost estimation is of great importance in project management as it provides substantial information for decision making, cost scheduling and resource management (Carr, 1989). Analogy cost estimation techniques, such as Constructive Cost Modelling (COCOMO), involves employing cost profile data from historical projects that are similar in design or operation, and calibrating the cost of current system based on the software metric differences such as size and capacity. This approach heavily depends on the availability of information from previous projects and thus lack of reliable data often results in the inaccuracy of cost estimating. Parametric cost estimation is an alternative to analogy cost estimation which involves converting base information into parametric input and is capable of producing more accurate cost estimates. However it does not account for the detailed individual components and the workflow in the system (Frank, 2002).

While both analogy and parametric models are based on “top-down” cost estimation, more accurate cost estimates can be achieved by bottom-up processes, which estimating the costs of individual components and totalling them up to produce the final cost estimate (Young and Markley, 2008). However, none of these techniques can be considered robust in terms of both data input requirements and degree of accuracy. The first systematic evaluation of the accuracy of cost estimates was conducted by Morrison in 1984 (Morrison, 1984). In the study, accuracy of cost estimates was measured by the deviation from the lowest acceptable tender in the project. Factors that affect the accuracy were identified as the variability of lowest tenders, the source of cost data used in estimating, the inherent error attached to the estimating technique and the suitability of cost data, in the order of importance. It was suggested that using previous cost data from projects where quantity surveyors have had experiences and using single source of cost data is likely to improve the accuracy of cost estimates.

In the UK, Akintoye and Fitzgerald (2000) investigated current cost estimating practices of contractors for the construction projects. The survey from 84 building firms showed that the contractors use cost estimating mainly for construction planning purposes rather than construction project evaluation. In the cost estimating practice, recent cost estimating techniques (e.g. range estimating and

parametric estimating) have not been widely adopted. From the survey, they concluded the major causes of inaccuracy in cost estimating as “the lack of practical knowledge by estimators, insufficient time for cost estimating, poor tender documentations, and the broad variability in subcontractor’s prices”.

In Australia, Aibinu and Pasco (2008) examined the accuracy of pre-tender building cost estimates by investigating 56 projects and surveying 102 firms. They found that estimation in construction industry in Australia is largely affected by the size of the projects. In small projects, the cost is normally over-estimated by a large amount rather than underestimated. Moreover, the accuracy of estimation has not improved over time, which implies that lack of experience plays a trivial role in biased cost estimation. They suggested better estimation practice by “probability estimation and simulation of past estimates, reducing quantity surveying and cost engineering skill turnover, incorporating market sentiments into estimates, early involvement of the quantity surveyor at the brief stage, and proper documentation of experience gained in the estimation of projects”.

In the United States, a comparative study conducted by Flyvbjerg et al. (2002) on actual and estimated costs showed that the costs in transportation infrastructure projects were significantly underestimated. The investigation from 258 transportation infrastructure projects indicated that 86% of cost estimation was overwhelmed, and actual costs were on average 28% higher than the estimates. Statistical analysis suggested systematic bias exists in cost estimation, which results from not only technical cause, but also from psychological/political reasons.

Nassar et al. (2005) conducted a study to evaluate construction cost escalations of asphalt paving operation in the United States. Based on 219 asphalt paving projects in Illinois during the year 2000, the causes of cost overruns were identified using statistical process control techniques (SPC). In their study, the major reasons for cost overruns were recognized as unpredicted additions, balanced final field measurement, and hazardous/controlled waste investigation and cleanup. Moreover, it was demonstrated that SPC analysis is powerful in managing and controlling project costs.

Having reviewed the above selected literature, it has been evident that cost overrun is a widely published topic among researchers. While numerous models and methodologies have been developed over past years on dealing the cost estimation and managing escalations in projects, there is still a significant knowledge gap emerging in establishing a reference or base model for improving the practices across the industry. This research aims to fill this gap by firstly analysing the underlying factors associated with the major players involved in project development environment from a cognitive perspective and then establishing a conceptual model covering all the phases over project life cycle. The remainder of the report will focus on the use of a cognitive methodology namely soft system methodology (SSM) in order to transform a fuzzy and unstructured picture into a realistic concept model in cost estimation practice (Checkland and Scholes, 1990).

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