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Construction Cost Estimates Related Risks

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Abstract: Construction projects are one-off endeavors with many unique challenges such as long period, complicated processes abnormal environment, financial intensity and dynamic organization structures and comes with enormous risks. One of the major challenges is to manage the initial cost estimate and the risk associated with it. However construction cost estimate is carried out under conditions of uncertainty. The preparation and accuracy of any type of cost estimate will depend heavily on the amount of information available and tools used during different project phases. While risks cannot be eliminated completely, where there is a cost but successful projects are those where risks are effectively managed of which early and effective identification and assessment of the relationships between cost and risks is essential. A good cost estimate: is built on understanding of the cost driven relationships and risk is one of these cost driven relationship associated with cost. Therefore risk is a cost that cannot be exactly measured with mathematical accuracy, then Cost and risk share a relationship which is verb and more so approximation relationship .With the exception to when a risk occurs and is translated into cost. In particular the risk analysis is used to examine the expected cost of the project and to assess whether the contingency allowance is fit for the project. The relationship between cost and risks is discussed in same details.

Keywords: Risk Analysis, Estimation, Construction, Uncertainty

Introduction

Determination and quantification of risks and their impact on project costs within the construction industry is one of the most difficult areas. A risk analysis of a construction cost estimate is prepared early in the feasibility of the project. In particular the risk analysis is to use to examine the expected cost of the project and to assess whether the contingency allowance is fit for the project .According to a survey of Philip Holzmann , 41% of the losses of construction projects is related to miscalculations in the Pre-contract phase and 22% to project risks. 30% of the costs incurs during the construction phase and only 7% is related to force majeure (unforeseeable circumstance that prevent same one from fulfilling a contract).An estimate derived from a traditional engineering analysis of the preliminary design plans and drawings. Have projects budgeted using a "cost per gross floor area" basis regardless of the project's associated risks and their impact on cost and time parameters, but risk and cost, are subject to change as the project progresses with more details. Risk is decomposed of the cost items of the project representing the major activities or acquisition costs. Each item like labor, material, equipment and indirect cost components. Different levels of indirect cost are attributed to different classes of items according to standard practice for example, the indirect cost component of a labor intensive activity as a higher proportion of the cost. Cost variability and uncertainty is acknowledged by incorporating a contingency allowance in the estimate. This is calculated as a proportion of the total construction cost. The contingency proportion reflects past experience in construction project and industry practices of the cost estimating team. Which has proven not be enough accord to the standard of the construction industry today, that is why the need to look at other better effective methods like Monte Carlo Simulation, artificial neural networks which in my view are better but the lack of expertise and skills in this area to the construction industry makes they are application unreliable by the practitioners

Cost Estimation

The American Association of Cost Engineers (AACE) defines cost engineering as "that area of engineering practice where engineering judgment and experience are utilized in the application of scientific principles and techniques to the problems of cost estimation, cost Control, and profitability." Cost estimating reflects a step-by-step plan of a project. This plan is translated into money value by applying unit costs to the quantities identified in the plan. Cost estimators predict how much of an item will be purchased, what will be paid for it, when it will be purchased, and, generally, where it will be bought. The concept of a cost estimate as a prediction is used throughout the construction industry to emphasize the fundamentally uncertain nature of cost estimation. Uncertainty means we do not have all information about the future, and assumptions we make today may come out differently in reality as the project progress. This uncertainty renders cost estimation procedures much more amenable to risk analysis techniques. The uncertainty inherent in a cost estimate is greatest when the available information is of the smallest quantity and lowest quality. As information improves, i.e., more and better information becomes available, the uncertainty in the cost estimate is gradually reduced. Until, at the extreme, all costs have

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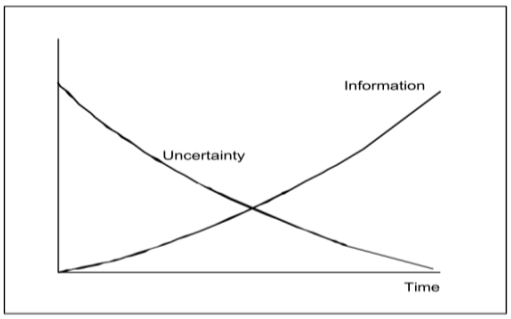
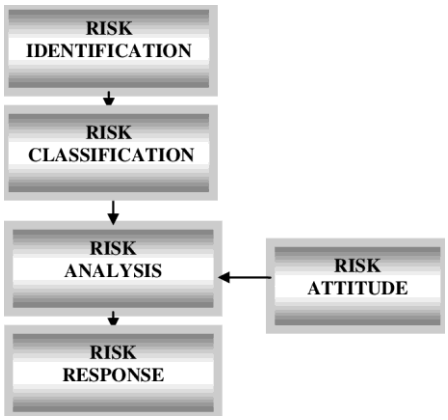
been incurred and costs are known with certainty. Figure 1-1 illustrates the trade-off between information and uncertainty.



The information that reduces uncertainty does not come cheaply. Because reducing uncertainty requires information and acquiring information takes time and money, a good cost estimate must strike a balance between how much information is required and how much residual uncertainty is acceptable. As long as the cost estimate remains a prediction, rather than the report of a finished project, there will be some degree of uncertainty. It is also important to note that the information required to reduce some uncertainty attending a cost estimate, for example, random acts of nature that can affect costs, may be unavailable at any cost. When uncertainty cannot be reduced because it is impossible or not cost effective to do so, it can either be ignored at the estimator's peril or it can be addressed in a variety of ways. A risk analysis framework for addressing the uncertainty inherent in the task of cost estimating, is one of them. Figure 2-2 illustrates the risk analysis frame work

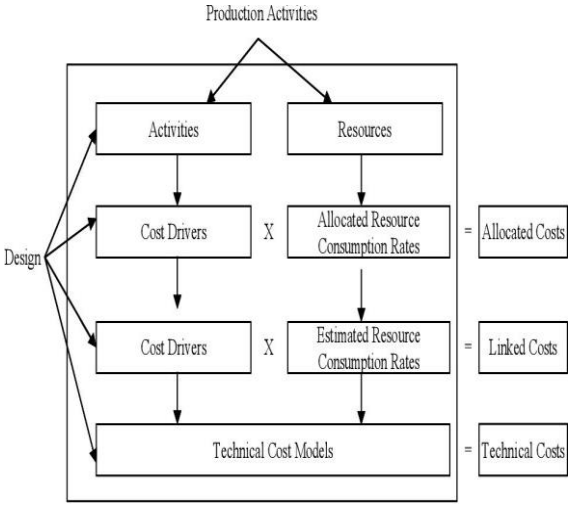


Importace Of Cost Estimation

1. The aim in a cost estimation process is to establish a realistic overview of the total project costs and its uncertainties. Even though tools and methods for taking uncertainty into account are implemented, projects with cost overruns are often seen
2. A cost estimate is often used in benefit-cost analysis to determine whether or not a project is economically feasible.
3. A cost estimate is used as the basis for cost sharing arrangements.
4. Cost estimates forms the basis for budget requests.
5. Contractors decide whether or not to bid on construction contracts using cost estimates.
6. Cost estimates are used as the basis for construction contracts.
7. Cost estimates are used to manage project costs

Cost Estimation Framework

Cost estimation framework figure 3-3



One major challenge of the cost estimation frame work in planning and control is the uncertainty. There are several definitions of the term uncertainty. We use one that is based on economic terms and is useful when working with planning and decision making. It follows from the original works of John Kenneth Galbraith and implies that uncertainty is the difference between the information needed to make a decision in certainty and the information actually available on the time of making that decision. The uncertainty comes from variability associated with estimates, and the basis of estimates, design and logistics, objectives and priorities, and fundamental relationships between project parties. The latest trends include discussing opportunities management in addition to risk management. The content and results of future activities and processes are uncertain and so are the conditions under which they will take place. Such uncertainty influences the planning, execution, result and outcome of project activities, and even their objectives. This implies that all projects involve risks of different nature and magnitude.

Risk In Construction

The definitions of risk covers both positive and negative effects. Both positive and negative effects have to be included for an uncertainty analysis to be complete. In

analyses, these effects may be characterized as estimation uncertainty (variability in time, cost, etc. for activities and conditions known to be present and which influence the result) and event uncertainty (probability and consequence of possible events). There are many fundamental reasons why even professional bodies struggle with handling uncertainty of things such as: lack of information (certain knowledge) about the future. Lack of practices that apply the latest and most updated knowledge about how human beings reason and think about uncertainty of risk and opportunities. The main challenge is ability to make informed future decision, construction project in nature take long periods to complete. Which standing to be a challenge in cost estimation and risk analysis, for processes are time dependent.(which means the main risk is the changes that come with time)short construction periods would cut off most of the risk associated with time variable.

Qualitative Risk Assessment

The goal of risk identification is not only to avoid omissions but also to avoid the opposite pitfall of being distracted by factors that are not root causes but only symptoms. Treating the symptoms, rather than the root causes, will give the appearance of activity but will not solve the problem. Unfortunately, identification of symptoms is far easier than identification of root causes. Project owners should ensure that the risk identification process goes beyond the symptoms.

Risk Analysis Approach

(Risk is a characteristic of a situation, action, or event in which a number of outcomes are possible)The increased national and international competition forces the constructors to focus on their core competence. These effects result in an increasing degree of outsourcing and a reallocation of the risks related to costs, time, schedule and quality .Smith in (1999) pointed out that expenditure on the assessment of major engineering projects represent only 10% of the capital costs of the project. However, during this period 80% of the total project costs are frozen. This shows how important the identification of the major risks and estimation of the costs at the beginning of a construction. Project items in the revising of estimate are used as the basis for risk consideration. These items are consolidated into activity/cost items as required to provide base costs for which common risks could be assessed. For some items having a large impact on the total cost of the project, decomposition is required. Alternatively, where several items having a relatively small impact on the cost are grouped together. The object is to ensure that sufficient details are employed to assess the risks accurately. Table 1 shows the item structure used in the analysis. A limited number of key risks factor were identified for each activity/cost item

Item structure used in the analysis table 1-1

Category of risk	Identified risk
Risk related to clients	Project funding problems Tight project schedule Variations by clients
Risk related to designers	Designers variation Incomplete or(inaccurate cost estimates) Inadequate information(soil test and site survey) Inadequate program scheduling
Risk related to subcontractors/supplies	Low management competency of suppliers Supplier's incompetency to deliver on material time.
Risk related with government agencies	Bureaucracy of government
External issues	Price inflation of construction materials

Quantity Risks

Design: The engineering design may not have been finalized, this refers to design changes that do not alter the overall concept of the project. For example, changes in concrete slab thickness.etc

Engineering approach: The detailed engineering was not complete, and there may be alternative approaches. For example, a different approach might vary the number of construction joints in the concrete structures and thus affect the quantity of form work required.

- Defining sometimes it was not clear in the estimate what was included or excluded from a line-item cost.
- Rock quality: Poor rock and other geological conditions might force excavations to be deeper than planned.

Estimation Drawings: might not be accurate or comprehensive enough for detailed quantity takeoffs, and other considerations like those noted above might not have been identified specifically.

Unit Cost Risks

Engineering approach: The engineering approach Might affect unit costs by varying the mix of labor and equipment. For example, the method for concrete delivery from the batch plant would affect the processing requirements for aggregates

Processing : The cost of processing quarried or borrowed materials might vary according to the availability of suitable materials

Form work : reuse the ability to reuse or repair form work would alter the form work unit cost. (This is related to the engineering approach)

Engineering and management : rates variations in contract conditions and in the number and types of

contracts might alter the requirements for site engineering, office engineering and management.

Estimation Unit-cost : estimation variations arise because of assumptions about productivity, equipment and labor costs, component costs, embedded materials, etc. Not previously considered.

Schedule Risks

It was assumed that if delays occurred or if a likelihood of schedule overruns was detected additional resources would be used to maintain the schedule, if possible Schedule-recovery risk is included to consider the consequences for the project cost of such changes to the project schedule.

Weather: Adverse weather conditions might cause delays.

Season; A late spring or an early autumn might reduce the summer construction period.

Equipment delivery: If electrical and mechanical equipment were to be delivered late, there might be a delay to commissioning.

Risk Versus Project Objectives

A direct relationship between effective risk management and project success is acknowledged since risks are assessed by their potential impact on the project objectives .Hence, employing effective risk management techniques to manage risks associated with variable construction activities has never been more important for the successful delivery of a project. A number research has mainly focused on examining the impacts of risks on one or two aspects of project strategies with respect to cost, time quality, safety and environmental sustainability. A comprehensive review of the current literature is as:

Project cost overrun risks include: inaccurate cost budget; price escalation of material and material-availability uncertainties; labor-market and labor cost increase; supplier or subcontractors' default; unpredictable weather; fluctuation in currency and interest rates; excessive interface on project management; political instability, corruption and unfamiliarity with local regulations.

Project time delay risks include: poor project scope definition; project complexity; inadequate planning; appropriate project schedule; design variations; inaccurate engineering estimate; inaccuracy of material estimate; material and equipment shortage; long lead-time items; shortage of skilled labor; poor labor productivity;unpredictable weather conditions.

Project environmental sustainability risks include: direct environment risks such as dust, harmful gases, noises, solid and liquid wastes; and indirect environmental risks which are influenced by a project but are not necessarily a direct result of the project, such as the exposure of contaminated materials during the excavation of soil for footing.

Why Do Risk A Nalysis Of Cost Estimates

This is simple because risk assessment asks what can go wrong, how it can happen, how likely it is, and what are the consequences. Traditional, single-point cost estimates are incapable of providing decision makers with such crucial information as;

- The probability of overrunning the cost estimate at all or by some percentage (e.g. Probability of a 20 percent overrun).
- How much different actual costs can realistically be from the baseline estimate (i.e., exposure).
- The most important factors contributing to a project's exposure
- The contingency required to obtain a certain level of confidence in a cost estimate.

Conclusion

Cost estimates are based on the information known at a given time. During the cost planning all the cost of the investment regarding resource acquisition and project implementation efforts should be identified, and future recurrent cost for operation and support have to be identified as well considering the costs of the entire life cycle of the product and not only the cost of the project. Managing risks in construction projects has been recognized as a very important process in order to achieve project objectives in terms of time, cost, quality, safety and environmental sustainability. Decisions such as outsource activities ,buy instead of making or resource sharing (in order to reduce costs)have to be considered during the risk analysis as they impact on the project cost ,whether risk that may be translated into threats or opportunities as well .In project cost estimates, identified risks and the cost associated with its plan to mitigate them must be documented ,whether they will be assumed ,transferred or reduced. In periods of higher competition, contractors are assuming more risk than usual. Further exploration of the recognized risks found that they are mainly related to contractors, followed by clients, designers, subcontractors/suppliers and governmental agencies, and occurred mainly in the construction phase, followed by feasibility and design phases.

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