

Aim of the proposed research

Within the cost estimation literature and in practice within organisations a range of cost estimation methods are used to predict costs prior to activities being undertaken. Estimates generated utilising different estimation methods provide different projections of the anticipated cost. The differences could have a significant impact on the overall viability of a project or the selection of the optimum design for the product or process.

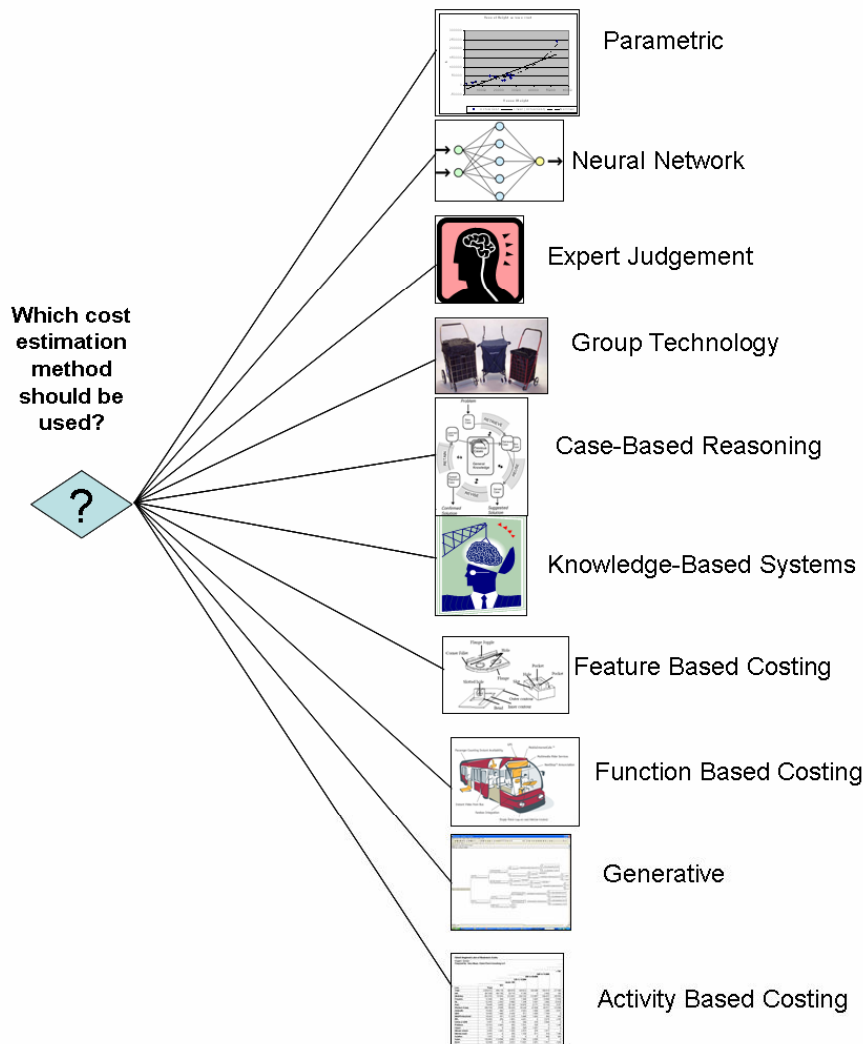
At present there is no model available that considers the effect of various influencing factors to determine the most appropriate cost estimation method for a given task. This leads to uncertainty about which method should be used and a loss of accuracy or wasted effort if a suboptimal method is chosen. The proposed research aims to address the problem by establishing the factors that influence the performance of the estimating methods and the requirements of the different estimating methods.

Cost Estimation Method Selection



What is cost Estimation?

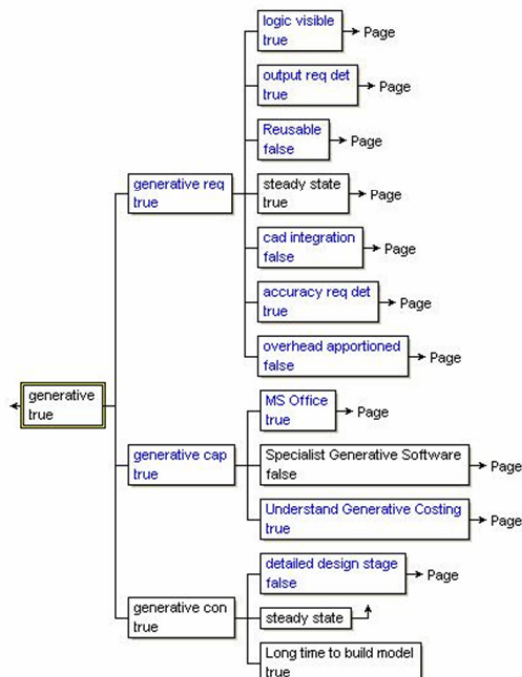
- Cost is the expenditure necessary for the attainment of a goal
- Cost Estimation is predicting the cost prior to undertaking the activity



All Methods have advantages and limitations

Method	Advantages	Limitations
Parametric	<ul style="list-style-type: none"> •Makes clear the influence of parameters on cost •Repeatable and objective 	<ul style="list-style-type: none"> •Parameters not included could become important •Simplistic
Neural Network	<ul style="list-style-type: none"> •Accurate estimates possible because of the detail •Can be updated and retrained 	<ul style="list-style-type: none"> •Logic not visible •Complex •Require a large case base to be effective
Expert Judgement	<ul style="list-style-type: none"> •Quick to produce •Flexible 	<ul style="list-style-type: none"> •Susceptible to bias •Unstructured •Different experts use different mechanisms
Function Costing	<ul style="list-style-type: none"> •Allows the integration of requirements and cost estimation •Allows designers to compare cost and functionality 	<ul style="list-style-type: none"> •Need to be able to allocate cost to functions •Does not generate an accurate estimate
Feature Costing	<ul style="list-style-type: none"> •Enables integration of CAD/CAM with cost information •Could be automated 	<ul style="list-style-type: none"> •No consensus on what features are •Require large resources to implement
Group Technology	<ul style="list-style-type: none"> •Can propose solutions rapidly •Intuitive- user knows the origin of estimate 	<ul style="list-style-type: none"> •Case base may be bias •Doesn't handle innovative solutions •Require a large case base to be effective
Case-Based Reasoning	<ul style="list-style-type: none"> •Can propose solutions rapidly •Plays the role of collective memory of the enterprise 	<ul style="list-style-type: none"> •Need a reliable case base •Doesn't handle innovative solutions •Require a large case base to be effective
Knowledge-Based Systems	<ul style="list-style-type: none"> •Logic is visible •Stores the knowledge of the organisation •Structured 	<ul style="list-style-type: none"> •Knowledge could become obsolete •Doesn't handle innovative solutions
Generative	<ul style="list-style-type: none"> •Accurate estimates possible because of the detail •Detailed breakdown useful for negotiation 	<ul style="list-style-type: none"> •Time consuming •Detailed data may not be available
Activity Based Costing	<ul style="list-style-type: none"> •Allocates costs according to where they are incurred •Gives a stronger indication of potential profitability 	<ul style="list-style-type: none"> •Time consuming •Detailed data may not be available •Allocation of overhead is complicated

How do you decide which cost estimation method to use?



Based on a literature review a set of rules have been established and embedded into a crisp decision tree model called using Decision Pro (<http://www.vanguardsw.com>). Decision Pro provided the functionality required to develop a rule based model and also gives an intuitive presentation of the analysis. Therefore it is possible to rapidly understand why the model generated the output. The rules used in the model are separated into three categories: Requirements; Constraints; and Capability.

Requirements define elements that the estimator wants from the estimate. For example, the estimator may desire a high level of accuracy or a reusable model. Constraints are the factors that affect which estimation method is applicable that are outside the control of the estimator. For example, the amount of time available to generate the model and the design stage that the product is in. Capability describes the ability of the people in the company and the software available. For example, if the company do not have neural network software the estimator cannot use neural networks for cost estimation.

Future Work

Semi-structured interviews with collaborating organisations will take place in order to acquire explicit knowledge about cost engineering procedures in the organisations. Additional knowledge acquisition techniques may be applied to elicit the tacit knowledge that the estimators are using. These interviews will capture the procedures that are being used within organisations and also the requirements, constraints and capabilities that organisations have.

At present the model that has been developed is simply states a true or false value for whether inputs are present or not and whether methods are applicable or not. In reality some of the model's input parameters are not as clear. Experiments will be undertaken to formulate non-Boolean inputs and outputs for the model. Rather than the model simply giving a Boolean result saying either a method is or isn't applicable the methods could be ranked from most suitable to least suitable and recommendations of what is required to make methods more applicable could be offered.