COMPUTERISED BUILDING COST ESTIMATING SYSTEM

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To My parents, Marjuki Hj Abd Sallam

Whom once said

“ We’ve no wealth to give except encouragement to seek for knowledge……

For knowledge is the grates treasures of all. “

To my children Raudahtul Alya and Muhammad Aiman Asyraaf

“ let this be your inspiration to seek knowledge…..”

To my loving wife, Samsiah bte Sadli

For all the sacrifices, understanding and affection.

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ABSTRACT

Estimating is an important process in order to prepare cost estimating for a proposed project. Cost estimate will give client an overview towards the total cost needed to be spent based on design. Due to the importance of the cost estimate for a proposed project, the utilization of computer to prepare cost estimate should therefore be practiced. The entry of computer technology in the estimating practice is a major event in the improvement of the traditional estimating method by reducing estimate preparation time, reducing the amount of paperwork required for the conventional data storage, and improving the quality of documentation. However, the actual use of the computer varies. Some companies use the computer for all projects and others do not use at all. The software are under-utilized due to its inefficiency in terms of difficulty, cost and because the program does not match with the company's style of estimate This study is intended to identify estimating techniques used by contractors for cost estimate, to identify problem causes using that techniques and to develop a computerized cost estimating system for contractors. The study has found out that most of the contractors were using approximate quantity estimating technique for their cost estimations using computers. However, some of them still prefer to use manual technique as it is easier to apply. Microsoft Excel is the popular software used by contractors to prepare estimate. However, there are disadvantages in using Microsoft Excel is that users have to create suitable format for each estimating work. A computer-aided-project-cost-estimating system has been created to fulfill the needs mentioned. The result of this research was a cost estimating system application named as COES (Cost Estimating System) With the fulfill utilization Microsoft Access 2003 and other Microsoft Access functions, COES has been able to produce cost estimating automatically. This system serves as a systematic framework comprising elements of building works in order to help contractors to prepare a more precise and systematic cost estimate.

ABSTRAK

Penganggaran merupakan proses penting yang bertujuan untuk menyediakan satu ramalan kos bagi projek yang dicadangkan. Anggaran kos yang disediakan membolehkan pihak klien mendapat gambaran secara kasar terhadap jumlah kos yang perlu dibelanjakan berdasarkan rekabentuk yang disediakan. Memandangkan pentingnya anggaran kos kepada sesebuah projek yang dicadangkan, maka penggunaan komputer untuk menyediakan anggaran kos perlu dipraktikkan. Kemasukan teknologi komputer dalam amalan angggaran merupakan peristiwa utama bagi memperbaiki kaedah anggaran dengan memendekkan masa penyediaan anggaran, mengurangkan jumlah kertas yang diperlukan untuk menyimpan data, dan memperbaiki kualiti dokumen. Walaubagaimanapun, penggunaan komputer sebenarnya berbeza-beza. Banyak syarikat menggunakan komputer untuk kebanyakan projek dan terdapat juga syarikat yang tidak langsung menggunakan aplikasi komputer. Perisian tidak digunakan kerana kurang efisien dari segi kesukaran, kos dan program yang tidak sesuai dengan kehendak syarikat. Kajian ini bertujuan untuk mengenalpasti teknik penggangaran yang digunakan oleh kontraktor dan membangunkan sebuah system anggaran kos projek berkomputer untuk kegunaan kontraktor. Kajian mendapati kebanyakan kontraktor menggunakan kaedah kuantiti hampir untuk menyediakan anggaran kos dan majoriti firma kontraktor telah menggunakan penggunaan aplikasi komputer untuk kerja penganggaran. Namun begitu, terdapat sesetengah kontraktor cenderung menggunakan kaedah manual walaupun kemudahan komputer telah disediakan dengan alasan kaedah manual adalah lebih mudah dan senang dilakukan. Perisian *Microsoft Excel* telah menjadi perisian popular kepada pihak kontraktor untuk menyediakan anggaran kos. Penggunaan perisian ini mempunyai kelemahan iaitu penggangar perlu mencipta format dan membentukkan formula yang sesuai pada setiap kali kerja penggangaran dilakukan. Dengan ini, sebuah sistem anggaran kos projek berbantukan komputer telah direkabentuk untuk memenuhi keperluan ini. Keputusan

kajian ialah satu aplikasi anggaran kos bangunan yang dinamakan sebagai COES (Cost Estimating System). Dengan menggunakan sepenuhnya perisian *Microsoft Access 2003* dan fungsi Microsoft Access yang lain, COES telah dapat menghasilkan sistem anggaran kos bangunan secara automatik. Sistem ini akan menjadi rangka sistematik yang merangkumi elemen-elemen kerja bangunan untuk membantu kontraktor untuk menghasilkan satu anggaran kos yang lebih tepat dan bersistem.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Generally, the process of awarding any construction contract is based on a competitive bidding. Contractors will be invited to submit their bids to the owner who normally awards the lowest bid to construct the project. Beforehand, both the owner and contractor have to access the construction cost of the proposed project. This is achieved through a construction cost estimate. Although, the actual total cost of construction is not known until the completion of the project, conceptual estimates can be a good start for the owner and contractor. The owner will be able to estimate in advance a range of the final cost, to secure the lowest cost to construct the project, and budget the necessary fund in advance. Considering an adequate contingency percentage to the total estimated cost covers such risk. In order to win the contract, the contractor bid price has to be low enough to compete with other competitors, yet high enough to cover his risks and make some profit. Consequently the importance of cost estimates is enormous for all project phase, moreover at the conceptual and feasibility phase.

The preparation of any type of cost estimate depends on the experience of the estimator, the tools used, the time spent, and the information available. Usually the preparation of an estimate starts by breaking down the project into components, then taking off the quantities of the elements of each package and next pricing them all.

Finally, by summing up the price the direct construction cost is computed. This process is long and complex but the most complicated part of it is the quantity take off. Consequently, computers are considered to be effective tools in cost estimating. due to their capability of doing complex calculation and storing huge amount of data for future use. Any decision concerning the construction of a project that has been or to be executed is based on one type of estimates, which are preliminary estimates, which their moderate level of accuracy owner, quantity survey and contractor consider them as the first choice estimates because they are inexpensive and fast to generate. Owner uses them to decide whether constructing a project is feasible and to evaluate contractors bids, while architect to design within owner's budget and considering alternatives, and the contractor to know if bidding on a project is profitable or not. Consequently, in the proposed methodology the concentration is on preliminary construction cost estimates with the emphasis on a computer as an avail tool for estimators.

1.2 Background

Computers are expending increasingly into all aspects of daily life. The cheaper computer hardware today has boasted the rush of using the computers. Although the move had been slow compared to the others, the construction industry is steadily coping itself with the advancement in the information technology system. As a result, the professional Architects, Engineers and surveyors had computerised their works, and the contractor had started to use computers for their daily business purposes. From a survey by Mohd Hisham Ariffin (2002), it is concluded that the Construction Industry Development Board (CIDB) G7-graded contractors were highly dependent on computer for the administration work while having mediocre dependency on computer for technical work which include scheduling, technical calculation, budgeting, estimating, and others.

The early uses of computers by construction companies were limited to accounting functions. With the advances in micro-computing, increased knowledge of computer capabilities, and the development of user-friendly software, computers have been used everyday construction to make quick and accurate decisions.

The method of pre-tender price estimating have been developed as manual processes. The computer can be used in conjunction with any methods of estimating for the rapid retrieval of cost data, of for calculating an approximate estimating. The advantage of using a computer is that an estimate, however detailed, can be updated quickly and efficiently for changes, which may be necessary in a revised design.

The computers potential in construction estimating has progressed from its use as an adding machine to an integrated process of computer-aided design (CAD), estimating software, job costing software and project scheduling systems. However the actual use of the computer for estimating is varied within the industry. Some companies use the computer for all projects and with high degree of sophistication.

There is a variety of estimating software program available. Some simply perform the mathematics of the estimating process, others integrate the estimating operation with other functions of the construction process. No matter how sophisticated the program might be, it is imperative that the estimator understands the calculation methods and assumptions used in the program. The estimator should be properly trained and should known all assumptions before proceeding with an estimate.

Computer estimating still involves the measurement of dimensions and compiling materials. This information can then be fed to the computer to obtain the labour, equipment and material costs that may be used to compile the estimate. To perform this type of function, the computer must be programmed to proceed through the required steps, and appropriate unit costs must be stored in it.

An estimator must assemble a large amount of information in an organized manner and perform numerous calculations to prepare a cost estimate. The computer can be used by the estimator to organize, store and retrieve information and to perform the many calculations necessary to prepare an estimate. It can be an effective tool for decreasing the preparation time and increasing the accuracy of cost estimating.

Numerous computer database can be developed to automate and standardize the estimating function. Historical cost database can be developed from the cost records of projects that have been completed by the company. Information from the historical cost database can be retrieved for the preparation of estimates for future projects. As new information is obtained from current projects, the historical cost database can be updated.

The advent of the relatively powerful and economical computer technology has realistically made the computer-aided estimating become feasible. The number of estimating products increased rapidly since the entry of an interactive computing system into the market. Accompanied with the emergence of estimating software, advance in the database management system has significantly influenced the development of a computer-aided estimating software. Therefore, it can be concluded that the entry of computer technology in the estimating practice is a major event in the improvement of the traditional estimating method by shortening estimate preparation time, reducing the amount of paperwork required for the conventional data storage, improving the quality of documentation. These advantages allow the estimator to pay more attention on decision making during the process of estimation and leave all burdens of data handling tasks to the automated system (Charoenngam, 1996).

1.3 Problem Statement

In general, it can be stated that the current estimating programs are unable to fully satisfy their own users. The available software are under–utilized due to its

inefficiency in terms of difficulty, cost and because the program does not match with the company's style of estimate (Charoenngam, 1996). There is very long learning curve for practicing estimators to operate the system especially for small companies (Lowe,1994).

Most estimating products focus on program manipulation and offer to much irrelevant optional features rather to concentrate on the core estimate preparation. The estimating method and techniques are different from regions, countries to countries, location to locations and companies to companies (Lowe 1994).

Therefore the research is needed because in Malaysia the use of Cost Estimating system was very limited. The most common and widespread method for taking-off was still the traditional method and spreadsheet method. In the mean time, although most of the contractors have their highly capable Cost Estimating system, there are still many of them who still use the spreadsheets program. The reason is that spreadsheet programs actually save more time than the Cost Estimating production system. For all this spreadsheet users, template or standard sheets were being developed to help out Cost Estimating process. The users will only have a key in the dimension and then, they will have quantities for multiple items in one single sheet.

1.4 Aim and Objectives Of The Study

The aim of this project is to develop a prototype computer – aided project cost estimating system which can help the users to prepare preliminary estimate cost of building works. In order to achieve the above aim, the following objectives of study have to be carried out.

1. To study the various conventional methods of estimating from contractors perspective.

2. To identify the software used by contractor for cost estimating in practice and the problems they faced in using the software.
3. To develop a computer – aided project cost estimating system by using Microsoft Access 2003.

1.5 Scope of Research

This study only covers the following scopes :-

1. This study concentrates on developing an application from taking off to automatic approximate cost estimating.
2. This study concentrates on building work only.
3. This study focused only on an assortment of contractors who has registered with Pusat Khidmat Kontraktor (PKK) and Construction Industrial Development Board (CIDB) in Johor Bahru.

1.6 Importance Of The Study

Although it is a simple application, which covers only the approximate cost estimating preparation process, it is a landmark application that cost estimate can be prepared automatically using Microsoft Access. This application will have the same capabilities with the expensive Cost Estimating production software in terms of preparing Cost Estimate.

As this application only requires Microsoft Access 2003 to run, the cost of obtaining and installing this application is thought to be much cheaper then the available Cost Estimate Production software. As a low cost solution, this will give the contractor much more opportunity to use the computer in preparing their cost estimate. As a result of this widespread usage, files can be shared among all the parties involved.

1.7 Research Approach

The idea of this research initiate from the researcher experience in using KAPPA-PCT Application Development System version 2.2 in doing preliminary estimate before architectural drawings can be produced. The prototype is developed in the form it is easy to understand and use. The user has to answer the questions appear on the screen such as type of school, location, year when the school is to be build, site condition and piling requirement, that is before the preliminary estimate can be calculated. They cannot accommodate detailed element for preparation cost estimate. Therefore, the first phase in doing this research is to make study on the Microsoft Access of whether it can be developed into a Cost Estimate Production application.

The second phase involves doing literature review on the Cost Estimate Production software or associated software available in the market. All the software was extensively being reviewed and it form a model for the proposed application.

The third phase is on learning to do programming in Microsoft Access. This is important because this application will be programmed by the researchers who have little experience in programming before hand.

1.8 Research Strategy Chart

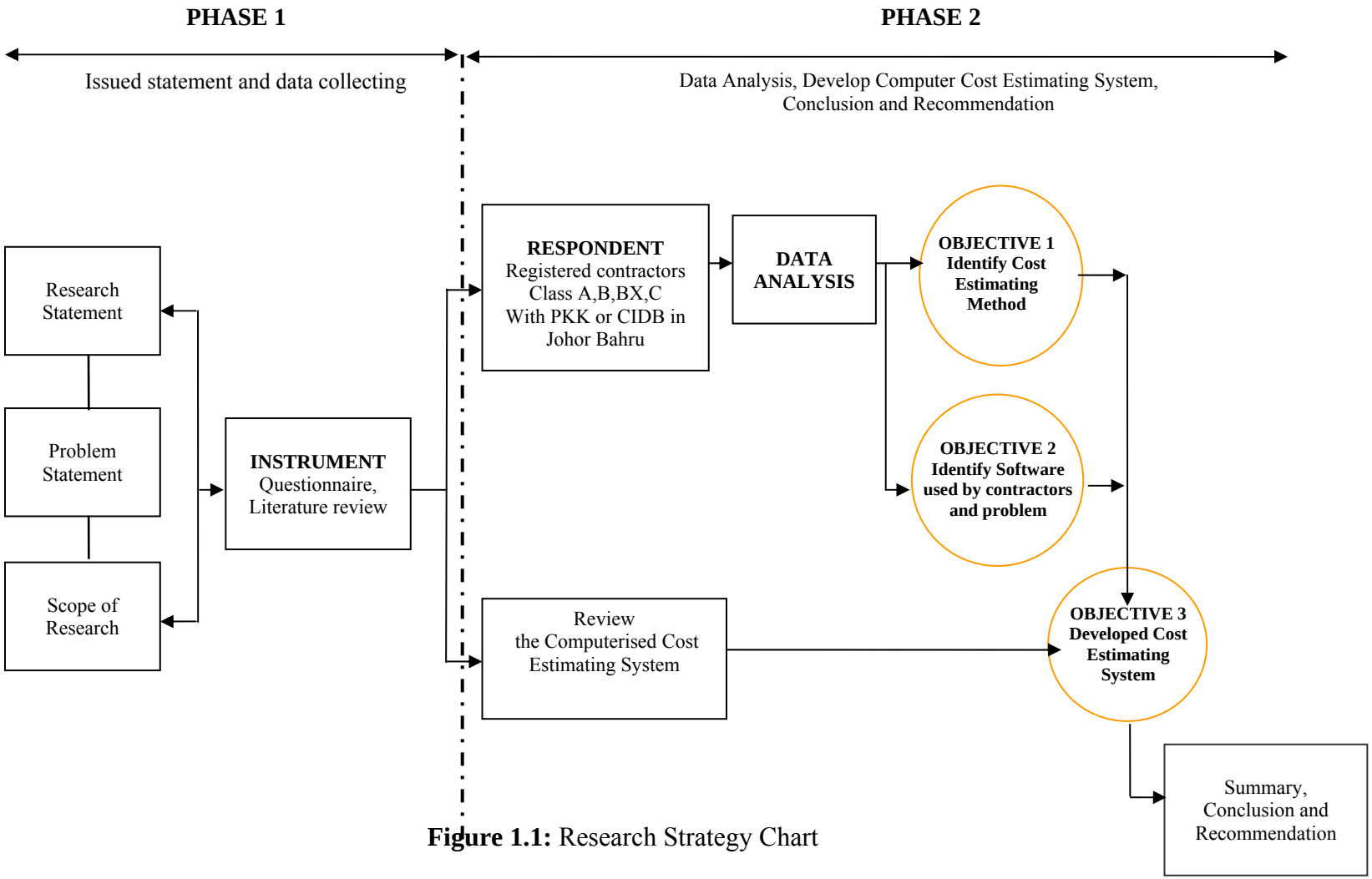

Figure 1.1: Research Strategy Chart

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