COLLABORATIVE USAGE OF ICT DBMS IN CONSTRUCTION COST CONTROL: THE POST CONTRACT PERSPECTIVES

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COLLABORATIVE USAGE OF ICT DBMS IN CONSTRUCTION COST CONTROL: THE POST CONTRACT PERSPECTIVES

SHAMSUL HADI BIN BANDI

A project report submitted in partial fulfillment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
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MAY 2008

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Proclaim! (or read!) in the name of thy Lord and Cherisher, Who created-
Created man, out of a (mere) clot of congealed blood:
Proclaim! And thy Lord is Most Bountiful,-
He Who taught (the use of) the pen,-
Taught man that which he knew not.
Day, but man doth transgress all bounds,
In that he looketh upon himself as self-sufficient.
Verily, to thy Lord is the return (of all).
Seest thou one who forbids-
A votary when he (turns) to pray?
Seest thou if he is on (the road of) Guidance?-
Or enjoins Righteousness?
Seest thou if he denies (Truth) and turns away?
Knoweth he not that Allah doth see?
Let him beware! If he desist not, We will drag him by the forelock,-
A lying, sinful forelock!
Then, let him call (for help) to his council (of comrades):
We will call on the angels of punishment (to deal with him)!
Day, heed him not: But bow down in adoration, and bring thyself the closer (to Allah.!

Al-Quran (96:1-19)

To:

Ashraf, S. Aiman, S. Aina, S. Amsyar, S. Aliff Eiffwat, M. Arshad Murshid, M. & Jaja, M.,

Victory at all costs, victory in spite of all terror, victory however long and hard the road may be; for without victory there is no survival

Shamsul Hadi Bandi
Universiti Teknologi Malaysia
6 May, 2008

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ABSTRACT

The purpose of this study is to facilitate the management of data and files in a Quantity Surveying firm by way of developing an Integrated Database and Information Management System (iDBMS). Findings from literatures suggest that, Quantity Surveyors have been hampered with the difficulty of giving a good and timely cost advice due to poor management of information and projects cost data which eventually lead to an ineffective cost administration in a construction project management. In order to develop the iDBMS, user requirements study has been carried out to practicing Quantity Surveyors to solicit their needs for the iDBMS. It was learned that respondents have rated two aspects of iDBMS features as vital in the development i.e. (1) Searchable 'search' menu, and (2) New way to organize, sort and group files based on files properties and not the current 'dump in a folder' files arrangement. In addition to iDBMS that has been developed, sessions of trial run has taken place, with respondents who had participated in user requirements study as ways to gain their feedback on the iDBMS developed. The trial run sessions were conducted in hands on environment; where respondents were given chance to operate and explore functions that have been developed. Respondents were then given set of questionnaires to be answered where likert scale with pre-determined evaluation table was used to record their feedback. Results from the trial run questionnaires suggest varieties of feedback where in most cases, further development of iDBMS was very much sought after. To conclude, the study has suggested three recommendations that were considered appropriate i.e. (1) Adding more features and functions to iDBMS, (2) Adding more process flow model, and (3) Compulsory implementation policy.

ABSTRAK

Tujuan kajian ini dijalankan adalah untuk mempermudahkan pengurusan data dan fail-fail di dalam firma perunding ukur bahan dengan cara membangunkan Sistem Pengurusan Maklumat dan Pangkalan Data Bersepadu atau dikenali sebagai *Integrated Database and Information Management System (iDBMS)*. Dapatan daripada tinjauan ke atas sumber pembacaan mencadangkan bahawa perunding-perunding ukur bahan mengalami kesukaran untuk memberikan khidmat nasihat berkaitan kos dengan baik dan cepat disebabkan oleh pengurusan maklumat yang tidak cekap. Masalah ini telah menyebabkan ketidakcekapan terhadap pengurusan kos dalam projek-projek pembinaan. Untuk membangunkan iDBMS, kajian kehendak pengguna telah dijalankan ke atas jurukur-jurukur bahan yang sedang berkhidmat untuk mengetahui kehendak sebenar mereka. Pendapat mereka amat penting untuk menjamin penerimaan yang baik terhadap iDBMS. Hasil daripada kajian kehendak pengguna mencadangkan bahawa aspek-aspek berikut sebagai amat penting (1) Menu carian yang mudah dan (2) Cara baru untuk menyusun, menjilid dan mengumpulkan fail-fail berdasarkan ciri-ciri fail dan bukan 'simpanan dalam *folder* seperti yang diamalkan sekarang. Sebagai tambahan terhadap pembangunan iDBMS, sesi-sesi percubaan telah dijalankan dengan para responden yang telah menyertai kajian kehendak pengguna sebagai cara untuk mengetahui maklumbalas mereka terhadap iDBMS. Sesi-sesi percubaan telah dijalankan secara langsung di mana para responden telah diberikan peluang untuk menggunapakai fungsi-fungsi yang telah dibangunkan. Para responden kemudiannya telah diberikan set soal selidik untuk dijawab dimana skala Likert dengan jadual penilaian yang telah ditentukan, digunakan untuk merekod maklumbalas mereka. Keputusan sesi percubaan telah merekodkan pelbagai keputusan di mana pada kebanyakan situasi, pembangunan berterusan terhadap iDBMS amatlah diperlukan. Kesimpulannya, kajian ini telah

mencadangkan tiga cadangan yang difikirkan perlu iaitu (1) Menambah lebih banyak fungsi iDBMS, (2) Menambah lebih banyak aliran proses dalam iDBMS, dan (3) Polisi mengwajibkan pelaksanaan iDBMS.

TABLE OF CONTENTS

2 DATABASE MANAGEMENT SYSTEM (DBMS) AND POST CONTRACT COST CONTROL

Database Management System (DBMS) in The Construction Industry

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will present an overview towards the whole content of the study. It will include the problem statements, aim and objectives, scope of the study and a methodology used for data collection and analysis. At the end of the chapter, a brief report outline will be presented which summarize the whole content of the study.

1.2 Problem statement

The noble relationship between cost, time and quality in construction is an inevitable need of everyone particularly those who holds stake in any construction project. Many have commented and suggest various ways in which this relationship can be improved (Morledge, 1996; Seeley, 1997). Often, however, inclination towards an aspect of the triangular of cost-time-quality will likely to result a loss which is considered normal in the industry.

In order to keep the loss below the margin of severity, Ashworth (1994a) has suggested a wider role for Quantity Surveyor to play. Quantity Surveyor should go

beyond giving cost advice by venturing into wider aspects of the subject of construction economics. Project cost control is the application of economic principles to the construction project. It examines not only the costs appropriate to a specific project, but also the factors and influences of the determinants of the cost (Ashworth, 1994b).

Over the past few decades, Quantity Surveyors have been hampered with the difficulty of giving a good and timely advice due to poor management of information and project cost data. The introduction of computer technology has eased the burden; however, this technology was only used to do little more than a clerical assistant had done for the manual system (Pilcher, 1985). Much of the problem still lies with the method of storing information needed for certain tasks. In most instances, files and information are kept in a separate folder for different and sometimes same functions. This issue, according to Stephenson and Turner (2003) is like using the conventional paper-based systems during the life of a project which leads to many documents copies being produced for distributions, and consequently many duplicates stores of the same information. Like records that were kept on paper-based system, digital files stored in different folder may lead to time consuming record retrieval. Those who are not used to certain project will inevitably spend a considerable amount of time just to locate a file. This will likely to deter the firm's approach for timely delivery of cost advice to members of a construction project.

Another critical concern that underlying the study is the exaggerate use of office resources for most tasks accomplishment. Cost advice by way of interim payment certificate for example, is very much man-hour intensive and often use large quantities of paper. Quantity Surveyors working for an interim payment certificate need to follow various procedure and often large amount of draft papers are needed. These drafts are not only meant for working but it sometimes used for validation purposes. In essence, the Integrated Database and Information Management System (IDBMS) developed will not totally provide solution for effective use of firm's resources, but it will promote ways which these resources can be utilized at an optimum usage. A study conducted by Mitropoulos and Tatum (2000) suggested

reasons why organization within the construction environment adopt an innovative approach to the application of information technology (IT). According to both authors, market and technology push, key personnel attitude, organization culture and availability of slack resources are among the factors which contribute to such a development of IT in construction. Further study by El-Mashaleh *et al.* (2006) has successfully demonstrated the positive correlation between cost and overall project performance for firms which adopt IT in their businesses in which foster the purpose of the study.

An advance state of the art computerized database and information management system is therefore timely needed to improve the Quantity Surveying firm's delivery system. Since cost advice by any means are the pinnacles of Quantity Surveying services, care need to be taken with information and project cost data as it will provide an invaluable source for the purpose of the advice. On the other hand, on time submission of cost advice to members of construction project is proved to be necessary especially where decision need to be made for certain aspects of the project. Change towards the approved design due to authority requirements for example may involve an outstanding variation to the initial budget. At this stage, important cost advice needs to be given by the Quantity Surveyors as to the marginal degree of addition and/or omission involves. This is the time where information and data handling proved to be crucially needed and an Integrated Database and Information Management System (IDBMS) may help to work things out.

1.3 Aim and objectives

The study aim to promote the usage of selected software as a tool to integrate information and project database in a single interface. Validation capability is another aspect that will be emphasized and embedded in the system. The developed system will combine two aspects of post contract cost control under studied i.e. 1) The preparation of interim payment certificate, and 2) The preparation of financial statement report. In order to achieve the desired aim, the following objectives have been set:

1.3.1 To identify the process flow and approval through secondary data for two aspects of Post Contract Cost Control under studied i.e. the preparation of interim payment certificate and financial statement report.

1.3.2 To design an Integrated Database and Information Management System (IDBMS) base on .Net framework which integrates aspects of Post Contract Cost Control under studied by utilizing result on user requirements study.

1.3.2 To conduct a trial run in order to gather feedback of the IDBMS developed. Observation result from the trial run will be recorded and reported through the application of appropriate analysis technique.

1.4 Scope of study

The study will circulate on the application of ICT for the purpose of cost control at the post contract stage. It will be pointing at the development of Integrated Database and Information Management System (IDBMS) by utilizing methods of post contract cost control practiced by Quantity Surveyors. According to Ashworth

(1994c) the following are the methods in which construction cost are controlled during the post contract stage:

1.4.1 Interim valuations and certificates for payments;

1.4.2 Cash flow control and forecasts through budgetary control;

1.4.3 Financial statements showing the current and expected final costs for the project;

1.4.4 Final account, the agreement of the final certificate and the settlement of claims

The IDBMS that is to be developed will fulfill the objectives set by integrating methods of post contract cost control mentioned above. The focus of the application developed will centered at preventing unnecessary duplication and storage of files by promoting integrated file sharing and retrieval among internal staffs of a Quantity Surveying firm. It will be extended to provide access that can be regulated and controlled in order to keep confidentiality level of certain documents. Furthermore, the application developed will ingress the optimum usage of firm's resources by reducing dependencies toward draft papers and extensive use of man-hour (project's Quantity Surveyor and support staff).

However, it should be noted here that the study do pose few limitations due to time and financial constraints. The scope of the study will only focus at two (2) aspects of post contract cost control which are 1) Interim valuations and certificates for payments (1.4.1) and 2) Financial statements showing the current and expected final costs for the project (1.4.3) (stated above). It should be noted that the decision to apply the abovementioned aspects are due to the author's experience of high frequencies of its preparation during a normal course of a project compared to the preparation of projected cash flow (1.4.2) and final account (1.4.4). Besides, the

preparation of Interim valuations and certificates and financial statements involves lengthy paperwork and procedures as what have been mentioned before. Thus, the selection of the above will be timely suited in respect of its purpose in practical sense and constraints stipulated above.

1.5 Brief Methodology

The research will apply the following methodologies:

1.5.1 An extensive desk research to identify the process flow and approval for two aspects of Post Contract Cost Control under studied i.e. the preparation of interim payment certificate and financial statement report. The desk research which is equivalent with literature review will centered on books, online journals, magazines, reports, white papers and unpublished masters and doctoral degree theses as well Quantity Surveying firm's work manual collected by the author throughout his working. These sources are invaluable as it gives the author a broad overview on the topic under studied.

1.5.2 Face to face structured interview with Quantity Surveyors from a selected firm in order to gather data on user requirements. The Quantity Surveying firm is selected base on the process workflow which has been adopted by the author with their due concerned.

1.5.3 Development of Integrated Database and Information Management System (IDBMS) by utilizing the .Net framework for two aspects of Post Contract Cost Control under studied i.e. 1) Interim valuations and certificates for payments and 2) Financial statements report which shows the current and

expected final costs for the project. The workflow design of the IDBMS system will follow Quantity Surveying firm's work manual collected by the author throughout his working and user requirements collected through the face to face interviews. It is important to point here that the decision to apply the firm's work manual has been made largely due to the author's self experience of preparing it before and limited and restricted access to study other firm's work manual. Though unstructured interviews has been done with colleagues who works with other Quantity Surveying consultancy firms, information collected were considered unreliable since no documentation are presented before the author. Thus, the adoptions of workflow or work process from the author's personal collection are deemed to be the most reliable information for the purpose of the study.

1.5.4 According to Pilcher (1985), the effectiveness of a system developed to control management of information in construction can be measured by comparison of the system output with the objectives of the system. In brief, the IDBMS is developed to meet the following:

i) To integrate information needed for the preparation of 1) Interim payment certificate and 2) Financial statement report.

ii) To facilitate record retrieval on any project by respective Quantity Surveyor.

iii) To promote electronic data transferal and validation among internal staff of a Quantity Surveying firm. This objective will help in reducing the need for draft paper particularly during the preparation of 1) Interim payment certificate and 2) Financial statement report which eventually optimize the office resources.

In order to gain the required data, questionnaire survey will be applied to record and report the result of the trial run. The methodology will comprise “tick-the-box” questions describing the benefits of the IDMS function. Respondents will be asked to validate the statements on the scale of:

i) Least agreed
ii) Fairly agreed
iii) Agreed
iv) Strongly agreed
v) Very strongly agreed

By the use of Five (5) point semantic scale, these five options were represented by the scores of 5,4,3,2 and 1 respectively. The scores are then subjected to frequency distribution analysis where results will be presented as finding.

Detail explanations of the abovementioned research methodology will be presented in Chapter 3 (Research Methodology).

Flowchart 1.1 will summarize the above process in brief.

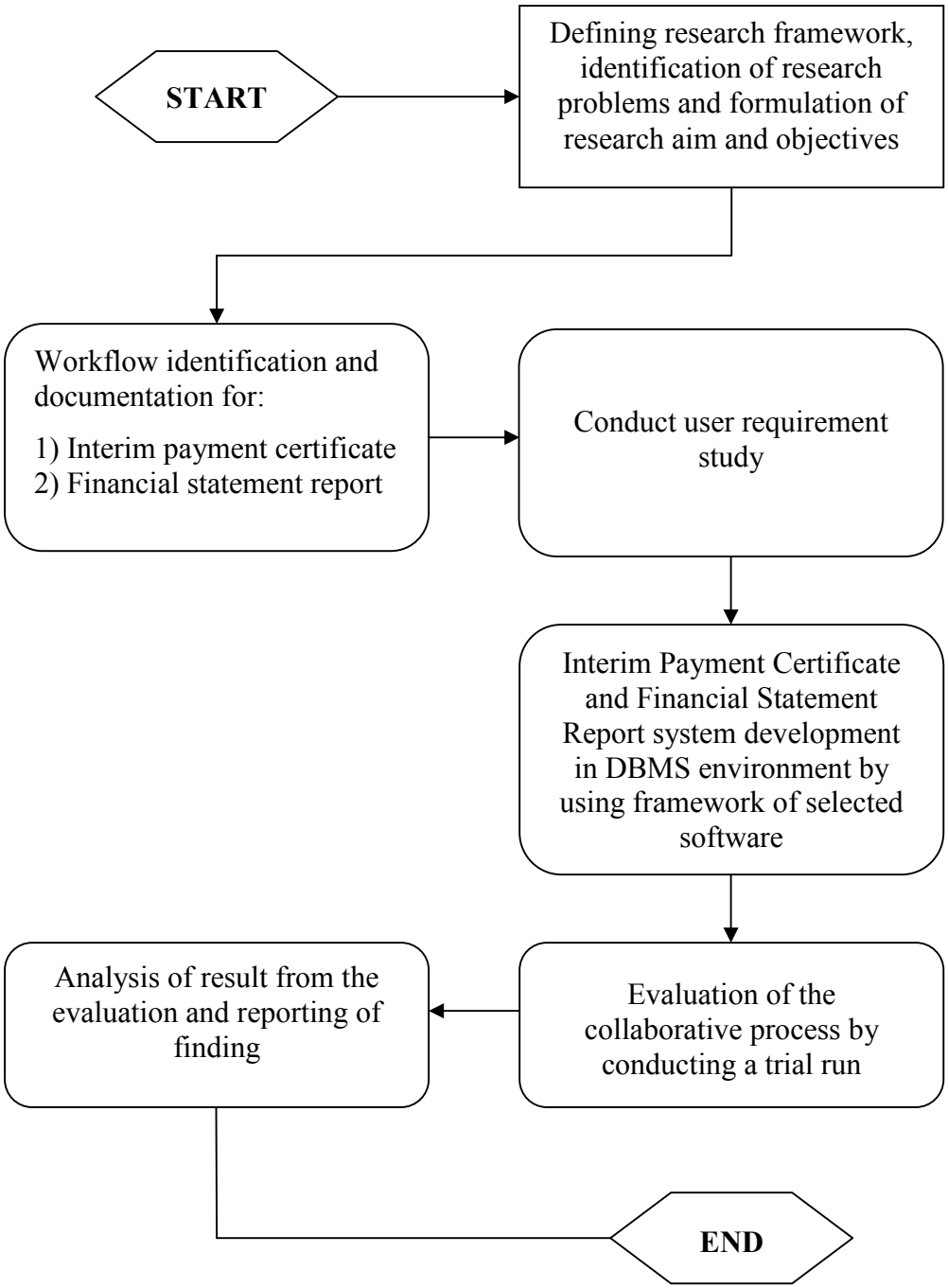

Figure 1.1: Summary of research process

1.6 Report Outline

The report will be divided into eight (8) chapters. The first chapter (Chapter 1) will explain the problem statement, aim and objectives, scope of study and brief methodology that will be used throughout the study.

The second and third chapter (Chapter 2 and 3) will elaborate literatures finding on Database Management System (DBMS) in construction. It follows by presenting the development of Information and Communication Technology (ICT) in construction, a review on the topic of user acceptance and the relationship between ICT on productivity and efficiency. Chapter 2 will continue by outlining the development of Database Management System (DBMS) in construction and end by a brief review on the software framework that is planned to be adopted. Chapter 3 will continues to elaborate literatures finding on DBMS and post contract cost control. It will explain 'control' in the context of construction and well its purpose and importance. Further, two function of cost contract cost control under studied i.e. interim payment certificate and financial statement report will be explained and conclude by the roles of DBMS in post contract cost control.

Chapter four (4) will elaborate the methodology used throughout the study together with the structure and description of the questionnaire survey. The questionnaire will collect data on demographic background of all respondents as well as their feedback on the system developed.

The fifth and sixth chapter (Chapter 5 and 6) will explain the development of the propose Integrated Database and Information Management System (IDBMS) by utilizing .Net Framework as part of the finding. It includes the hardware and software requirements, system architectural scheme and features in relation to information and files retrieval in respect to the preparation of interim payment certificate and financial statement report within the system developed. It follows by explaining