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JUDUL: **ELECTRONIC DOCUMENT MANAGEMENT SYSTEM IN CONSTRUCTION INDUSTRY**

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ELECTRONIC DOCUMENT MANAGEMENT SYSTEM IN CONSTRUCTION INDUSTRY

NORUL IZZATI M.ASHAARI

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

Faculty of Civil Engineering
Universiti Teknologi Malaysia

JUNE , 2007

SUPERVISOR'S DECLARATION

"I declare that I have read through this project report and to my opinion this report is adequate in term of scope and quality for the purpose of awarding the degree of Master of Science (Construction Management)

Signature : _____

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Date : _____

STUDENT DECLARATION

"I declare that this project report entitle "Electronic Document Management System in Construction Industry" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree

Signature : _____

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Date : _____

To my beloved Mum and Dad ,Kakna, Kakda, Bair, Aru, Fiq, adik
Thanx for your pray and never-ending supports

Mohamad Izwan Mohamad Hassan
Love always protects, trust, hopes and perseveres
Thanx for your patience and love

Ju, 5 years with me in UTM..thanx for being such a wonderful friend
Ija, Dina, Pia, farah, Azee..
Hana, Gui..Rhu..
Aliaa and Loloq SRASRD
Happiness happens when good friends get together..

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ABSTRACT

The application of Electronic document management system (EDMS) in construction industry in Malaysia as a whole are relatively slow compared to other industry. The increased volume of document production has aggravated problems in document security, control, tracking, and retrieval that lead to the need of EDMS. This paper analyzes how the implementation of the EDMS can contribute to the effective way in managing documentation in the Quantity Surveying firms. The author propose EDMS framework particularly during tender document preparation's process. The research objectives are identifying current practice of managing documentations during tender document preparation's process using semi-structured interview, identifying the effective EDMS that able to improve documentation process using case-study method and to develop Framework for EDMS by identifying EDM components and EDM application in the steps of Tender Document Preparation process using Delphi Methods. The significant result shows the various ways in managing documentations in QS firms. The case study indicates that the EDMS implementation needs the proper planning, knowledge about the EDMS application process, training and also budget allocation. The EDMS frameworks are found to be the best solution for the problems occurred in current practice approach of managing documentations. The validity of these frameworks have been verified by expertise which also the respondents of this research. The frameworks that have been developed are Framework for EDMS implementations, Framework for EDMS Application Process and EDMS Framework for Tender Document Preparation Process that will be the main outcome of this research. These frameworks which illustrated as flowchart and graphics are essential to be used as guidelines for the new users to implement EDMS in the organization as a whole or in any selected stage in construction process.

ABSTRAK

Aplikasi 'Sistem Pengurusan Dokumen Berasaskan Elektronik' atau '*Electronic Document Management System (EDMS)* dalam industri binaan secara keseluruhannya adalah rendah jika dibandingkan dengan industri lain. Peningkatan dalam penghasilan dokumen telah menyumbang kepada masalah keselamatan, pengawalan dan pengeluaran semula dokumen yang mendorong kepada keperluan menggunakan sistem ini. Kajian ini menganalisa bagaimana pelaksanaan sistem *EDM* boleh menyumbang kepada keberkesanan pengurusan dokumen di firma ukur bahan. Penulis telah mencadangkan Rangka Kerja sistem khasnya semasa proses penyediaan dokumen tender. Objektif kajian ialah mengenalpasti praktis semasa dalam pengendalian dokumen semasa proses penyediaan dokumen tender dengan menggunakan pendekatan temubual semi-struktur, mengenalpasti sistem EDM yang berkesan untuk menambahbaik proses pengendalian dokumen menggunakan kaedah kajian kes dan membangunkan Rangka Kerja sistem EDM dengan mengenalpasti komponen sistem EDM, perisian dan alatan yang diperlukan menggunakan teknik Delphi. Keputusan kajian menunjukan bahawa terdapat pelbagai kaedah yang digunakan dalam pengurusan dokumen di firma ukur bahan. Kajian kes menunjukan bahawa pelaksanaan sistem ini memerlukan perancangan yang teliti, pengetahuan proses aplikasi sistem, latihan and peruntukan kewangan. Didapati bahawa Rangka Kerja yang dihasilkan adalah pendekatan terbaik untuk menyelesaikan masalah yang dihadapi dalam praktis semasa pengurusan dokumen. Kesahihan Rangka kerja ini juga telah disahkan oleh semua responden. Antara Rangka Kerja yang dihasilkan ialah Rangka Kerja untuk Pelaksanaan Sistem, Rangka Kerja untuk Proses Aplikasi Sistem dan Rangka Kerja sistem EDM untuk proses penyediaan dokumen tender yang juga hasil utama dalam kajian ini. Rangka Kerja ini yang diillustrasikan dalam bentuk carta alir dan rajah adalah sangat berguna kepada pengguna yang ingin mengaplikaskan sistem EDM dalam sesuatu organisasi atau dalam apa jua peringkat dalam proses pembinaan

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The construction industry is still considered a relatively traditional labour intensive industry, which is characterized by temporary project organization with many participants involve. Computers have been widely used in construction industry with a considerable portion of 'document produced digitally'. Electronic Document Management System (EDMS), a relatively new class of Information system with Information Technology (IT) application has been introduced to provide accurate and up to date project information to the all project team members.

Some pioneering construction organizations have applied EDMS to their organization or projects. However, the introduction of EDMS in construction industry in Malaysia as a whole are relatively slow compared to other industry, instead of using traditional document management system. This due to the fact that design and construction are highly fragmented process where many temporary project organizations are involved. Hence, it is very complicated to have a common acceptable IT platform shared by each company involve in that specific cooperative project (Qing Yang, 2000).

Electronic Document Management (EDM) focus on facilitating the management of documents, pertinent to projects and work group in computer networks. EDM also focus on the control of electronic document, document images, graphics, spreadsheet, word processing files and compound document from its creation until document is archived. Commercial EDMS has started to use web technology as their implementation platform.

It is clear that the prominence of document management in the construction industry has to be shifted from managing paper based document to manage electronic document. EDMS communicates to people and meets their needs in handling document related activities such as searching, distributing, and managing at each stage of the construction process (Magnus Buckblum, 2003). Today, managers in the construction industry have realized that the new development strategy has to pay more attention on the application of IT, in order to achieve a competitive edge in the documentation management.

The benefits of EDMS in the construction industry can be found not only in the reduction of time during the document's circulation among project partners, but also reduced cost in document creation and distribution. Within the context of the construction industry, the emergence of Internet and Local Area Network (LAN) opened up opportunity for project partners readily exchanging and sharing all sorts of project document, including previous and latest version of the specific document. Supported by client server and databases technology, construction project documents can be stored in a specific document database accessed by the authorized project partner through Internet or LAN from different locations.

The task of managing all the information and documentation required to design and construct any major facility is a real confront. Many believe that more efficient information management is a primary mechanism for the construction industry to increase its productivity (Egan, 1998). A solution which builds incrementally on the current documentation practice in the industry is to enhance this practice through the wide-spread adoption of EDMS, applied within companies and in particular across all the participants in projects (Tarandi, 1998).

In order for EDMS to deliver any of the potential benefits within a construction project, it must be properly implemented throughout the entire project organization. Being a relatively new tool for many practitioners, the implementation process must be planned and executed carefully. Proper implementation requires strong management commitment, detailed document management guidelines, sufficient training, resulting in widespread and proper use of the tool.

1.2 Problem Statement

The current situation in the construction industry is that the mixture of different generation methods is used for managing the documents. Nowadays, major documents are produced in electronic manner, but many are still transferred by printing them out and sending them to the other parties by hand, email or couriers and often using copying companies as intermediaries. The technology for producing, managing, duplicating and distributing such documents has, however, undergone a number of fundamental changes (Matthias Hjelt, 2005). A larger construction project may eventually result in the production of tens of thousands of documents so that the system must provide user-friendly methods to find the document's needed. Without an effective way of documenting information learned during the project's lifecycle, the partners' useful and past experience was lost once the project was finished. This decreased the possibilities for design reuse in the future.

Technically there are several ways in which document retrieval can be facilitated (Lownertz, 1998). One option would be to use full text search that works much the same as the general web search engines and the results are equally unpredictable. An additional difficulty is that drawings are a very important document category in the construction industry and are difficult to include in such searches.

The lack of a common information structure for information exchange among project partners is another issue when the project is in building design stage, especially for collaborative design. In order to co-operate efficiently with project information, it is necessary to coordinate the information structures in a design project and for all participants to understand how the information or document is organized.

Many efforts have been made by design and construction organizations aiming at setting a common form of information to improve information exchange and management. However, many attempts to organize common form of information in a company have failed because of the overwhelming efforts needed in keeping information up to date (Lownertz, 1998). A slightly more sophisticated method is that documents are produced digitally and transferred digitally as e-mail attachments. Although computers produce large portions of the building design and construction document, there are only limited construction document handed in by digital form.

The impact on overall construction costs of out-of date, missing or contradictory information, causing delays, mistakes and expensive re-building, is well known both to practitioners and researchers (Alshawi and Ingirige 2003). Today the widespread availability of personal computers and the "information superhighway" created by the Internet provide the necessary infrastructure for efficient computer aided document management. Recently some systems have appeared on the market which claims to offer the capability for searching for text strings inside the DWG-files used for drawings.

The question, which so far has received little attention, is how to handle various type and changes to the documents at each stage in construction process. There is a concern about document synchronization in the document changing process, since a change to the documents may involve a number of documents in various ways. This research will focus on the use of electronic document stored and change management during construction process in the particular consulting firm/organization. Success in EDMS will then, provide accurate and up-to-date

project information to the project partner. In contrast, failure in handling document change will ultimately result in outdated information for decision-making, task redundancy, and projects running behind schedule.

1.3 Aim and Objectives

The aim of this research is to proposed EDM framework particularly for Quantity Surveying firm in order to improve effectiveness in managing document in electronic manner. The objectives of the research are:-

1. To identify current practice of managing documentations during tender document preparation's process.

2. To identify the effective EDMS that suit and able to improve documentation process.

3. To develop EDMS frameworks for tender document preparation process.

1.4 Scope and Limitation of the Research

In order to achieve the research objectives, the research scope will be focusing on the:-

a) The scopes of this research are limited to Quantity Surveying (QS) Firm and EDM service market providers in Malaysian market.

b) Organization from other industry that used EDMS will be used as a reference to identify effective EDMS and to provide reference for EDM framework development.

c) EDMS frameworks are referred to EDMS components, Service Market Providers, software and hardware requirements.

d) The research in Quantity Surveying Firms will be focusing on the document management for company administration and during tender document preparation stage only.

1.5 Importance of Research

The importance of the research can be determined by analyzing the benefits from the EDMS's implementation in the organization. Basically, the framework of EDMS is useful as a guideline to the professionals to manage their documents properly and systematically by applying IT knowledge to the organization.

The use of electronic documents and office automation systems make them think how to evaluate the company's content management problems. Therefore, by using EDMS, it can assist the personnel to search and find valuable information efficiently and then store the documents properly. This system is used to control the approval and distribution tasks in the document life cycle. The EDMS framework which will be develop by the workflow or work services will help the people in the organization easily find the document based on the construction flow process. The workflow is based on rules that will transmit electronically a task with a document or some document to the desktop of the professional or personnel in that particular project.

This research can be used as a basis to the new user to look for the alternative way to manage their documents especially when the volumes of the documents are increased. This application can be use as a solution to the document security. This come from the situation where the increased volume of document production, publication and corporate wide distribution through e-mail or manual

system. Besides, this research can provide the knowledge about EDMS and how to implement it in the organization.

1.6 Expected Findings

The research objective will be use as a basis to envisage the result of the research. Low rate of EDM application are expected among the respondents in the organization. The respondents are facing with some problems in managing the documents in using the traditional methods or paper based system. The barriers of implementing EDMS in the organization include the issues of changing organization work culture, cost of software installation and lack of knowledge about this system. The most common method in changing documents among project partner is by using E-mail approach.

The research will emphasize the benefits of EDMS functionality and the criteria for successful EDMS according to recorded case study to encourage the local construction organization to apply this system. The EDM framework that will be the final outcome of this research will be used as a guideline to the new user. The framework will use Readiris system software with the hardware requirement to the EDM implementation in Malaysia. It is expected that proper employment of the EDMS could help to improve the management efficiency and increase personnel productivity to manage their document in appropriate and systematic manner.

1.7 Structure of the Research

The research has been outlined to six chapters. The explanations for each chapter are as followings:-

1. **Chapter I: Introduction**

   This chapter is outlined to give the basis to develop the research. The main contents of this chapter are aim and research objectives, problem statements, justification and importance of the research

2. **Chapter II: Construction Process and Document Management Systems**

   Chapter two outline the background of the research related to literature on functions of documents in the organizations; the construction process; current state of document management in construction industry and; knowledge of EDMS. This chapter also describes about EDM technological evolutions, Electronic Document Change Management (EDCM), and also Quantity surveyors responsibilities during pre-construction stage.

3. **Chapter III: Research Methodology**

   This chapter outlines the research framework to be taken in research implementation. It describes the selected methods process in order to achieve the research objective. The steps and methodology highlighted in this chapter is very useful to give the guideline to this research and subsequent studies.

4. **Chapter IV: Data Collections for Current Practice in Quantity Surveying Firm and Department of Information Systems, MARDI**

   The data collections for the first and second objectives will be analyzed in this chapter. The research findings will be discussed to relate it with the theoretical factors as stated in research background

5. Chapter V: Electronic Document Management System Framework

Basically this chapter will discuss about the main outcome of the research that will be the research framework. The data collections from chapter 4 will be used as a basis to develop the EDMS framework. This chapter will describe about EDMS components, the requirements to implement EDMS, framework for EDM application process, general steps to be taken to implement EDMS and framework for tender document preparation process.

6. Chapter VI: Conclusion and Recommendations

Typical contents of this chapter consist of summary of research findings, problems encountered during research implementations and solutions for that particular problems and suggestions for future research.

1.8 Conclusion

This chapter was given introductory of the research background to use as a basis to develop the research. It included problem statement and importance of the research for justification purposes. Aim and objectives of the research create the target of the research to be achieved. Some considerations are show on the document management problems in pre-construction phase using paper-based system. The ideas presented here is an initial step on this research in order to have a theoretical framework for this research. Hopefully this research is useful to anybody who wants to understand about the knowledge of EDMS.