A FRAMEWORK FOR DESIGN INFORMATION MANAGEMENT SYSTEM FOR ARCHITECTS

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ABSTRACT

Architectural design solutions are outcomes of information manipulations by designers. An activity in the architectural design process may require inputs from other phases. The architect must be able to keep track of the amount of information required to accomplish a design task, which is a difficult task to perform. A design information management system is required to assist designers with new ways of managing and handling design projects. Despite the difficulty of managing the information flows and the availability of tools and techniques that can assist in manipulating the flow, there is still a lack of research to better understand and manage these flows. Architectural design is characterised by rework (iteration). Many of the available process models are not capable of representing these iterative processes. The models that are capable of identifying iterations do not provide means for managing them. In this work, we review existing information system framework, information modelling tools and techniques, and propose an information system framework termed ADIMS based on web services to manage architectural design information. The work also addresses the problem of architectural design information management from the information flow perspective by introducing the design structure matrix as a modelling tool to aid in a better understanding and management of the flow of information within the RIBA work stages.

ABSTRAK

Penyelesaian rekaan senibina merupakan hasil manipulasi maklumat oleh para pereka. Sesebuah aktiviti dalam proses rekaan senibina memerlukan input dari pelbagai fasa lain. Arkitek mestilah mampu menjejaki pelbagai maklumat yang diperlukan untuk menyiapkan sesebuah tugasan rekaan, yang mana merupakan tugas yang sukar untuk dilakukan. Suatu sistem pengurusan maklumat rekaan diperlukan untuk membantu para pereka dengan cara-cara baru dalam mengendalikan dan menyelesaikan projek-projek rekaan. Walaupun terdapat masalah dalam menguruskan susunan maklumat serta kesediaan alatan dan teknik yang boleh membantu dalam memanipulasikan pengalirannya, masih terdapat kekurangan dalam penyelidikan untuk memahami dengan lebih baik lagi tentang pengaliran maklumat ini. Rekaan senibina bercirikan iterasi. Kebanyakan model proses yang sedia ada tidak berupaya untuk mewakili proses-proses iterasi ini. Model-model yang mampu mengenalpasti iterasi tidak mampu menyediakan cara untuk menguruskannya. Dalam projek ini, kita akan meneliti rangka kerja sistem maklumat yang sedia ada, peralatan pemodelan maklumat dan tekniknya, serta mencadangkan sebuah rangka kerja sistem maklumat yang berterma ADIMS yang berasaskan servis-servis web untuk mengurus maklumat rekaan senibina. Projek ini juga menerangkan masalah pengurusan maklumat rekaan arkitektual dari perspektif pengaliran maklumat dengan memperkenalkan struktur rekaan matriks sebagai sebuah peralatan pemodelan untuk membantu dalam pemahaman dan pengurusan pengaliran maklumat dalam lingkungan kerja RIBA.

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LIST OF ABBREVIATION

ADIMS	Architectural Design Information Management Systems
AI	Artificial intelligence
BI	Business intelligence
CM	Content Management
DAM	Digital Asset Management
DBMS	Database Management Systems
DM	Document Management
DSS	Decision Support System
ES	Expert Systems
FAB	Faculti Alam Bina
HTML	Hypertext Markup Language
HTTP	Hypertext Transport Protocol
IMS	Information Management Systems
I/O	Input/output
LCM	Learning Content Management
LM	Learning Management
MIS	Management Information Systems
RIBA	Royal Institute of British Architects
RM	Record Management
TPS	Transaction Processing Systems
UML	Unified Modelling Language
UTM	Universiti Technologi Malaysia

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CHAPTER 1

PROJECT OVERVIEW

1.1 Introduction

Information management can be considered as a cycle of processes which support the organization learning activities. The activities are; information needs identification, information acquisition, organizing and storage of information, developing information products and services, distributing information, and information usage (Woo, 1995). It is an umbrella term that encompasses (Woo, 1995) all the systems and process within an organization for the creation and use of corporate information (Woo, 1995).

Architects as designers need information from a very broad source, in order to come up with a solution to such design problem. Traditionally, this information could come from books, other documents, colleagues and experts (Jambak et al., 2005). Usually, when designers obtain this information they will keep it in their mind, or in their very own repository. Therefore, it is difficult for other designers to obtain the same information in case they have to solve similar design problems. This

situation may lead to a risk of wrong decision and overlooked concepts (Jambak et al., 2005).

Architectural designs as well as other designs are characterised by its ill defined problem, therefore the methods of obtaining those solutions are also poorly defined (Ozakaya and Akin, 2006). To be able to come up with a solution, designer needs to discover the real problem. Though, the solution still cannot be completely validated (Ozakaya and Akin, 2006). The designer should therefore decide when a problem is sufficiently described. Knowledge and information are critical to effective design and product development. As such solving and specifying design problems go hand in hand. According Ozakaya and Akin (2006), information consistency and updating leads to significant overheads in design.

Designers need design information management systems in order to find new ideas and to solve their design problems. As such, the result of a design project depends largely on the expertise and information a designer have before he starts to search and retrieve information. Determining the information required by designers to do their design task and to help them update their knowledge towards problem solving is one of the most difficult aspects of deriving information management plan in a creative environment.

The amount of data, information and knowledge to be handled by the designers is often too broad, and unmanageable. Despite the availability of sources surrounding designers, getting access to the correct and required information for a particular design is often very handy, and a very uneasy task to perform. This problem results from both the ambiguity between sequence, keywords, relationship, connections and also due to the types and size of data and information from other sources. As such, many designs are being generated without the benefit of existing information in the design environment. This work is aimed at developing an information system framework that will assist architects with ways of managing design information.

1.2 Background of the Problem

The increasing complexity of buildings (Pektas and Pultar, 2005), competitive global markets, and rapid advances in technology (Wu et al., 2004), have been forcing design professionals to improve their process in terms of time and quality (Pektas and Pultar, 2005). One major obstacle affecting architectural design is the lack of systematic design planning in many building projects (Formoso et al., 1998). The planning is at times performed in an intuitive manner based on discipline specific programs (Pektas and Pultar, 2005). This is due to the fact that, a limited effort is made in identifying and managing the flow of information in the architectural design process.

Different researchers assisted designers in a number of ways. Some used the design structure matrix to restructure complex design projects in order to develop better products (Eppinger et al., 1994). Others (Pektas and Pultar, 2005), introduces the use of parameter analysis tool for building design with an aim of revealing the process structure, optimum sequence of parameter decisions, iterative cycles and concurrency in the process. Wu et al., 2004, proposes an information framework by integrating web services and agent technologies to manage collaborative product development process. Szykman, 2002, developed a design repository software system in order to address terminological and semantic issues associated with computer aided product development.

There are different types of information in the architectural design phases. This information can be in the form of audio (communication between the architect and the client), in the form of sketch (bubble chart), architects drawings, contract documents, etc. The information from earlier phases provides inputs to later phases. As such there is a need to assist the architects with ways of managing this architectural design information so that they can retrieve and used it as at when needed.

This study proposes an information system framework to assist architects to manage design information. The work also proposes a model of the flow of information within the architectural design process by introducing the design structure matrix as a modelling tool for understanding and manipulating the information flow.

1.3 Statement of the Problem

Information is essential to the success of such design work. However, designers in any activity have their own way of finding/collecting information during the design process. It is a need to support designers to collect information while not restricting their design activity. In order to develop such a system (information system) that nature to designers or architects, an information framework that can guide the system developer is needed.

The research questions that this project focuses on are;

1. How to model the ways architects collect information to solve their design task?
2. What is the suitable framework for a design information management system for architects?

1.4 Research Objectives

The objectives that pave the way for the project are:

1. Collecting requirements and understanding the flow of information in architectural design process.
2. To develop a framework for design information system for architects based on the collected requirements.
3. To develop a simple prototype as a proof of concept for the framework.

1.5 Scope

The scopes which identify the boundaries of the project are;

i) Only architectural design will be considered.
ii) Only looking at the way architects follow the architectural design process/phases.
iii) Only the information flow within the design process will be considered.
iv) Only the deliverables of the early phases of design will be considered in developing the information system framework.

1.6 Importance of the Research Study

The knowledge of the ways that designers collect information to develop the building design, the source of the information, and the format of the information and how the query is done will assist in modeling the information seeking processes. The model will thus assist in developing a framework for the design information management system for architects. Some benefits of the framework are:

1. Easy way to design and modify an information management system for Architects.
2. Simplifying the information seeking process for solving design problems.
3. Assist designers with a more effective way to re-use design knowledge and information.

1.7 Chapter summary

As a summary, this chapter provides a general introduction and overview of the project including the problem background. Problem statements, project objectives and the scope of the project have been clearly stated. The goal of this project is to develop a framework for design information management system for architects.

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