

MOBILE APPLICATION PROTOTYPE FOR ON-SITE INFORMATION
MANAGEMENT IN CONSTRUCTION INDUSTRY

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This dissertation is dedicated to my family, for their full support over the years it has taken to finish this important chapter of my life. This is also dedicated to my wife, Samaneh, who has been a wonderful counselor and given me moral support whenever I needed it. You are the most precious things I have in this world. I love you all.

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ABSTRACT

The construction industry is information intensive. Although the amount of information has increased over the past years, the number of advanced information technology applications used to collect, access, and use this information has not grown accordingly. For instance, current commercial information technology applications are very specific and lack simplicity and functionality. This study developed a mobile application that can be used to improve information management during construction projects. To achieve this aim, the information required to properly design the mobile application was collected by distributing an online questionnaire among construction professionals. Then 10 critical on-site information artifacts, considered important from the perspective of consultants and contractors, were selected for prototype development. A server-based application was developed based on enterprise content management concepts. The mobile application was tested in a laboratory by construction management students at Universiti Teknologi Malaysia (UTM). The test results demonstrate that the application is well designed and user friendly.

ABSTRAK

Industri pembinaan merupakan industri yang mengandungi jumlah maklumat yang intensif. Walaupun jumlah maklumat telah meningkat selama beberapa tahun kebelakangan ini, penerapan teknologi maklumat canggih untuk mengumpul, mengakses dan memanfaatkan maklumat belum berkembang dengan pesat. Sebagai contoh, aplikasi komersil teknologi maklumat terkini adalah sangat khusus, merumitkan dan tidak mengandungi fungsi yang banyak. Penyelidikan ini bertujuan untuk mengembangkan aplikasi mudah alih yang boleh digunakan untuk meningkatkan keberkesanan pengurusan maklumat dalam projek pembinaan. Untuk mencapai tujuan ini, maklumat yang diperlukan untuk aplikasi mudah alih dikumpulkan dengan menyebarkan soalan di laman web kepada kalangan profesional industri pembinaan. Seterusnya, 10 jenis maklumat yang dianggap penting dari perspektif perunding dan kontraktor telah dipilih untuk membangunkan prototaip mudah alih tersebut. Sebuah aplikasi berasaskan pengkalan data komputer dibangunkan berdasarkan konsep pengurusan maklumat. Aplikasi mudah alih ini telah diuji di makmal oleh mahasiswa pengurusan pembinaan di Universiti Teknologi Malaysia (UTM). Keputusan ujian menunjukkan bahawa aplikasi tersebut telah direkabentuk dengan baik dan ia adalah mudah untuk digunakan.

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LIST OF ABBREVIATIONS

ICT	-	Information and Communication Technology
IT	-	Information Technology
WWW	-	World Wide Web
PC	-	Personal Computer
PDA	-	Personal Digital Assistant
3G	-	3rd Generation of Developments in Wireless Technology
WLAN	-	Wireless Local Area Network
GPRS	-	General Packet Radio Service
CAD	-	Computer-aided Design
SA	-	Situation Awareness
SPSS	-	Statistical Package for Social Science
SDLC	-	System Design Life Cycle
ECM	-	Enterprise Content Management
CLT	-	Central Limit Theorem
CMA	-	Construction Mobile Application
CTMC	-	Construction Technology and Management Centre

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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Information and communication technology (ICT) has made a significant contribution to the construction industry. It supports traditional tasks, improves the communication barriers, speeds up processes, and manages information. Unfortunately, the construction industry remains behind other industries and it is still in the early phase of adopting modern Internet technology. (Klinc et al., 2010; Shen et al., 2010). Most construction companies, for instance, rely on manual processes and traditional communication tools such as emails, faxes, and phones (Dave et al., 2010). A survey conducted on small- to medium-sized construction companies in Taiwan reveals that almost all respondents used e-mail as both an internal and an external communication tool (Chien and Barthorpe, 2010). Thus, there is no centralized repository for all project data among those companies. Such a repository can be used as a form of communication between the project participants and for the integration of project information. This issue has been discussed for two decades, yet the problem still exists in the construction industry. (Dave et al., 2010).

Construction industry is labor-intensive. Various construction personnel require large amounts of information. This information ranges from drawings, which are produced in the design stage, to different project reports, which are prepared during the construction stage. Information is obtained from all stages until the end of the project. Thus, the fusion and management of construction information are crucial due to the diversity and intensity of the information. (Chen and Kamara, 2008a; Soibelman et al., 2008). This is a real challenge in construction projects, and is a primary step in productivity improvement.(Bjork, 2003).

On-site information management is critically important because it is the fundamental element of successful project management (Tsai, 2009). Information and communication technology (ICT) tools are used in construction industry for accurate and efficient information management. They are commonly available in administration offices or on-site offices.

Because carrying a PC or even a laptop is inconvenient for construction managers, in particular when they are climbing up and down in a construction site, all information regarding construction projects such as project progress records, site diaries, daily reports, and so on are recorded in the site office. Thus, recording the information will be postponed until the construction managers come to the site office. Therefore, there is a gap between the observation and recording of the information that causes loss and mismanagement of the information in conventional methods.

1.2 Statement of the Problem

The amount of information in construction projects is abundant. In addition, this information is unstructured and very complex due to the participation of

different parties. Applying inefficient means for communicating project information is a factor that causes two-thirds of construction problems. As such, streamlining on-site information flow seems both necessary and important (Dawood et al., 2002).

Although, the development of the information technology (IT) gives the construction industry a powerful potential to increase the efficiency and effectiveness of the information exchange (Chen and Kamara, 2005), the IT application for collecting, accessing, and using of the information has not grown properly (Irizarry and Gill, 2009). For instance, there are plenty of commercial products for IT application, but they are very specific, lack of simplicity and functionality (Forcada et al., 2007).

Current information and communication technology support has been extended to site offices. The advances in affordable mobile devices, increases in wireless network transfer speeds, and improvements in mobile application performance provide a profound potential for enhancing on-site information management (Chen and Kamara, 2008b)(Chen and Kamara, 2008b)(Chen and Kamara, 2008b). Consequently, developing a simple and functional mobile application, which can benefit the construction industry by streamlining on-site information flow, is crucial. Consequently, developing a simple and functional mobile application which can benefit the construction industry by streamlining on-site information flow is crucial. The application can be used in medium- and large-size construction projects where the management of on-site information has a significant influence on achieving project objectives.

1.3 Aim and Objectives of the Study

The aim of this study is to develop a mobile application that can be used for improving information management in construction projects.

The objectives of this study are:

- i. To investigate the information requirements of a mobile application that can be broadly used in the construction industry.
- ii. To develop a prototype for a mobile application based on current demands of construction professionals.
- iii. To evaluate the usability of the prototype based on usability test techniques.

1.4 Scope of the Study

In order to achieve the objective of this research, this project will adhere to the following scope:

- i. The questionnaire is distributed among contractors and consultants.
- ii. Since the objective of the study is to address the viability of developing a mobile application system in construction projects, the elaboration of the on-site information and investigation of the sub information remains outside the focus of this study.

- iii. The usability test is performed in a laboratory.
- iv. Top 10 critical information is considered for developing the mobile application.

1.5 Methodology

Figure 1.1 shows the research methodology that was adopted for achieving the objective of the study. The methodology of this study has four main stages including identifying the problem, the literature review and identifying the aim and objective of the study. At the end of stage two, the data collection is completed, and all required data are ready for analysis. Stage three starts with data analysis and continues with prototype development. The usability test is performed in stage four. The appropriate conclusion has been made at the end.

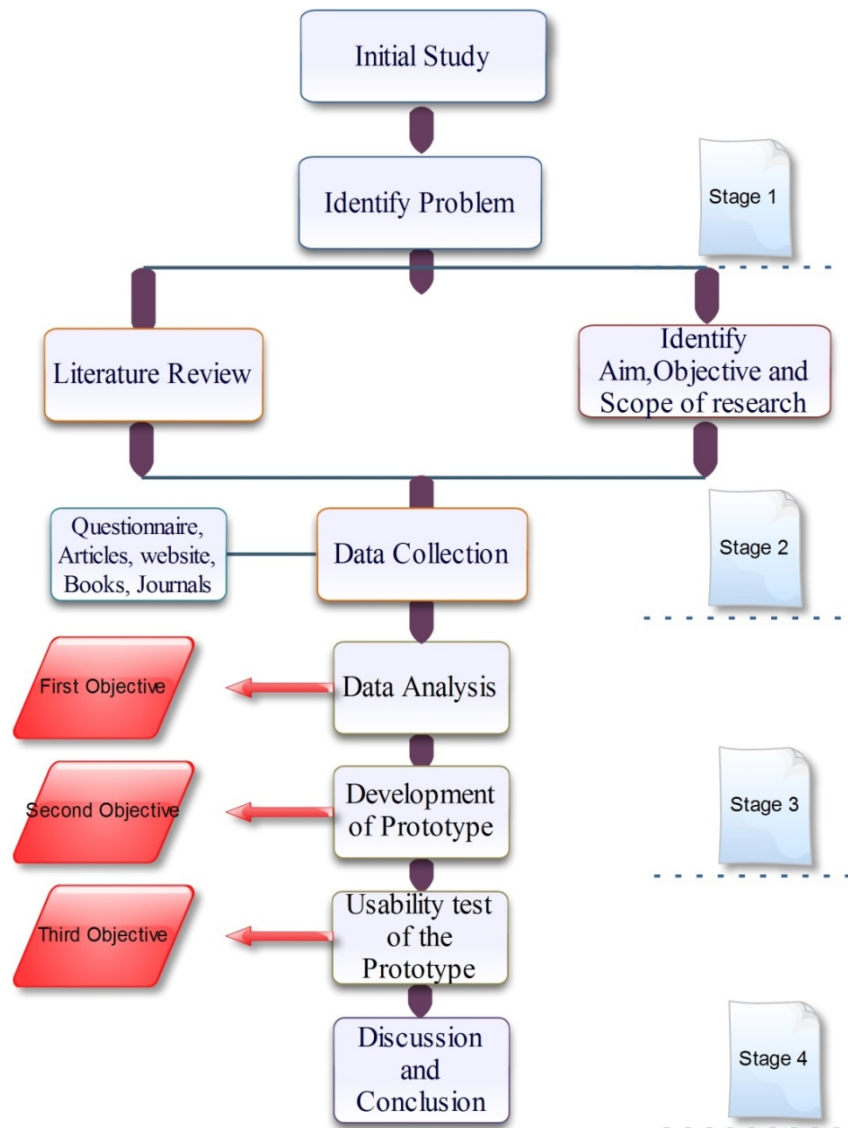


Figure 1.1: Methodology of the study