

Capabilities and Challenges of Mobile Computing in Construction Industry

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Abstract

Mobile computing can be defined as a new term of technology, devices, and services that allow transmission of data, voice, and video in wireless systems. Although mobile computing has many advantages in the construction industry, but some of the users do not exactly know what is the true function of mobile computing that can apply to the construction industry. Consequently, the users only use their mobile computing to perform easy tasks in the construction so the application of mobile computing in the construction industry is low. Problems such as slow progress of site management, difficulty in accessing data and information, human error are due to the low or non application of mobile computing. The aim of this study is to evaluate the capabilities and challenges of mobile computing in construction industry in order to provide convenience and efficiency to the user in the construction industry. In the collection of primary data, a survey questionnaire is sent to the target respondents in the states of Kuala Lumpur and Selangor. The collected data are presented in Relative Importance Index (RII) and one sample t-test. The result shows that better project management is the most significant capability of mobile computing in construction industry, while cost of technologies and software is the most serious challenge in applying mobile computing in construction industry.

Keywords

Mobile computing, capabilities, challenges.

Introduction

In the starting of 1990's, the introduction and implementation of mobile computing has been greatly recognized because of the capabilities that attained the vision of "Information at your fingertips anywhere, anytime" for the past two decades (Mahadev, 2010). Mobile computing can be defined as a new term of technology, devices, and services that allow transmission of data, voice, and video in wireless systems.

According to the invention of mobile computing, the concept of mobile computing consisted of three major components which are mobile computers, wireless network, and mobile

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applications (Rebolj and Menzel, 2004). The mobile computers were designed with a portable concept such as laptops, smartphone, tablet, PDA, and others, which allow the user to use indoors and outdoors. Furthermore, the role of the network is to support the connection and communication of the mobile computers through the wireless network such as Wireless Wide Area Network (WWAN), Wireless Local Area Network (WLAN) and Wireless Personal Area Network (WPAN). Therefore, the software is acting as a mobile app that can support and enable the mobile computer users from different roles in the construction industry to work more conveniently and efficiently during the work processes.

This study focuses on the mobile computing capability in providing portability, connectivity/network and mobile apps in the construction industry. Portability is one of the most significant characteristics of mobile computing. One of the main objectives for mobile computing is about reducing the size of the hardware that could allow the user to carry the device side by side to access information, transfer of information and others anywhere and anytime (Margaret, 2010). Therefore, the mobile computers can keep the users in-touch, through connection of wireless network for transmission of data, voice record, video, and call. Furthermore, the connection of the network at the mobile computing can allow the user to download and use of mobile apps at the device such as social media, document viewing and recording, design, camera, and others (Jesper, 2010).

According to the analysis from (Anoop, Taylor, 2015), the problems of seldom or non-use of mobile computers in the construction industry will bring distraction to the worker, slowing down the progress of site management, hard to access data and information, human error, and others. The workers who do not commonly use mobile devices in construction will find it hard to get connected with the office while undertaking work at distributed locations. During the emergency situation at the site, the worker will be having trouble sending an alert directly to the office notifying the changes or unexpected events (Sandra, 2018).

Without the use of mobile computing by the leader or the manager of the project, it will also slow down the progress of site management because construction companies may have multiple projects running simultaneously. Therefore, the huge numbers of equipment, labours, and materials will bring confusion to the leader while taking longer time to manage it, compared to using the construction management app (Sandra, 2018). The mobile computing valid to help the leader to track and manage the progress of a project to prevent delay of completion (Anumba, Wang, 2012).

Therefore, the worker will also experience difficulty in accessing and receiving information outdoor. During site visit, workers will need to check and record the progress of the project, the workers will have a hard time finishing the specific work without mobile computing (Andy, 2019). On the opposite hand, the use of mobile computing would easily tackle this difficulty as the devices can view up-to-date information and drawings and capture the site progress by using the mobile apps. Moreover, the portable concept of mobile devices, that have a capability to connect wireless local area network (WLAN) in a location that consist of WIFI and wireless technology to access data and information at anytime and anywhere (James, 2019).

Human error can lead to defects and serious failures can happen all levels of project organizations. In the example of human error, using the mobile computer to record or manage the meeting can greatly decrease or minimize the possibilities of memorizing problem thus reduce the occurrence of errors (Andrew, 2010).

Research Objectives

- 1) To determine the significant capabilities of Mobile Computing.
- 2) To identify the challenges of applying Mobile Computing in Construction Industry.

Capabilities of mobile computing in construction industry

Time and cost reduction

The general benefits of the mobile computing are to minimise time and cut capital cost in the construction industry. The mobile computing is capable to carry out paperless work such as recording meetings or information exchanges. Chitu and et al (2002) stressed that mobile computing not only brings benefits of paperless work, but also provides more affordable prices compared to full-powered computers. The capabilities of mobile computing also bring convenience to the worker to access and transfer data in different locations to reduce travel time. (Bowden, 2005)

Predictability and quick decision make

The mobile computing can also allow the user to access and get accurate information quickly from the internet. The workers can share data and information from anywhere and anytime which allows leaders to make decisions in due time (Sattineni and Taylor, 2015).

Better project management

By using apps and software on mobile computers, the manager of the project can easily track the tasks given to the workers in their time of work in order to manage and keep the progress of the project on schedule. Therefore, the apps and software can also help in managing the resources, such as accuracy of equipment productivity, instant repair requests, and accuracy of the material. (Pauline, 2019)

Increase of productivity

The improvement of productivity is one of the main goals to be attained in the construction industry (Abdel, Vogl, 2011). The using of mobile computing to access mobile applications, documentation, taking pictures, project plans and other pieces of information can be used to create reports and manage processes in order to reduce risks of mistakes occurring and improve productivity. (Sitalakshmi, Pak, 2009)

Challenges of applying mobile computing in construction industry

From the information gathered from secondary sources, the challenges of applying mobile computing in construction industry include:

- i. Security issues
- ii. Cost of technologies and software
- iii. Qualified professional and additional training
- iv. Technical issues

Research Methodology

The secondary data is collected from articles, books, reports, online newsletters and websites. Meanwhile, quantitative method is chosen as the approach to determine the construction team members' perceptions regarding the capabilities and challenges of applying mobile computing in construction industry. The questionnaire is sent to 91 construction firm in Kuala Lumpur and Selangor via E-mails. 35 responses received thus the response rate for this study is 38.46%. The statistical tools used for data analysis are Relative Importance Index (RII) and one sample t-test.

Data Analysis

Objective 1: To determine the significant capabilities of Mobile Computing.

Table 1. RII and Rank Based on Overall Data

Capabilities of mobile computing	1 (least important)	2 (not important)	3 (important)	4 (most important)	RII	Rank
Time and cost reduction	4	15	7	9	0.650	2
Predictability and quick decision	7	6	17	4	0.632	4
Better project management	12	3	5	14	0.654	1
Increase productivity	9	9	4	12	0.640	3

Objective 2: To identify the challenges of applying Mobile Computing in Construction Industry.

Table 2. T-value Based on Overall Data

Challenges	T-value	Standard error of difference	Critical t-value	DF (Degree of freedom)
Cost of technologies	5.2030	0.176	2.441	34
Security issues	4.4429	0.193	2.441	34
Qualified professional and additional training	4.4429	0.193	2.441	34

Conclusions

In conclusion, the most important capabilities of mobile computing in industry is improving project management which is ranked 1 in RII test and the T-test shows that the cost of technologies and software is the most serious challenge in apply mobile computing in the current construction industry. The capabilities of mobile computing shall be further promoted in order to achieve the goal of better process of construction.

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