

# The application of PDA as mobile computing system on construction management

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## Abstract

This paper reports a development of mobile computing system with personal digital assistants (PDA) for construction managers on construction sites. First, this paper describes the aim, the concept based on end user computing (EUC), and the essential element of the mobile system. This also shows the necessary functions for the mobile computing, and the concept of this computer-aided engineering system. Secondly, this paper describes the structure of the system and the outline of subsystems: Inspection System, Checklist and Reference System, Position Check System, and Progress Monitoring System. The system has two programs: the data input program in PDA and the output program in PC.

- Inspection System assists architects and construction managers to inspect the result of construction especially for finish works.
- Checklist and Reference System assists construction managers to access the checklist and the reference such as drawings and specifications.
- Position Check System assists construction managers to check and correct the position of structural members such as the steel column and the form.
- Progress Monitoring System assists construction managers to monitor the progress of projects.

Finally, this paper indicates the development of more refined process of construction management with the mobile computing device on construction sites.

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## 1. Introduction

The office automation from the late 1980s has improved the productivity of office works rapidly. Construction managers have recently handled various

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types of digital information such as drawings, specification, checklists and daily reports [6,7]. However, they need to access the real construction site to manage the construction project. They usually use sheets of paper and/or field notes. As a result, they still have a lot of typical and routine jobs in construction site, such as the collection of construction data and the inspection. A gap in time and space between the outdoor construction site and the office, which leads to the low efficiency, occurs.

On the other hand, various kinds of mobile devices have been adopted to field jobs on construction sites [20]. In the case of Japan, the electric pocketbook had been used as mobile computing device in the early 1990s [1,12]. The laptop PC has been used too. During the mid of 1990s, some computer manufacturers have produced handheld PC and palm-size PC. Their function has advanced year after year. The current personal digital assistants (PDA), which is a current palm-size PC, can handle the various types of data including not only texts but also drawings and pictures. The processing speed of PDA has also developed.

The current mobile computing can improve the field work in construction, and enhance the productivity of construction management [17]. Some systems with the mobile computer have been developed [10,11,13,15,16,18]. The paper presents the mobile computing system based on the end user computing for project management.

## 2. Mobile computing and end user computing

### 2.1. What does the mobile computing change on construction site?

The Personal Computer is an essential tool in construction management today. However, construction managers usually use sheets of paper and/or field notes for their outdoor jobs. A gap in time and space between the outdoor construction site and the indoor office can cause the duplex, lack and confusion of data. The efficiency of construction management is not high.

The mobile computing can eliminate and/or decrease this gap. Construction managers can use digital data input with the mobile computing device

on construction site effectively [2,6,7,19]. Moreover, some application software can enlarge the performance of the mobile computing. Their total system will realize the labor saving and rationalization of construction management. As each job in construction is strictly scheduled, construction managers must review the program and make decision within time. The mobile computing will help them.

### 2.2. What is necessary for the mobile computing of construction management?

Construction is usually outdoor. Authors arranged the necessary functions for the mobile computing system and its devices through the interview and discussion with construction managers.

- Mobility of Hardware: Construction managers want the pocket size of hardware.
- Durability of Hardware: The strength for the physical shock, the rain, the wet and the dust is necessary for hardware.
- Compatibility of Hardware and OS: It is suitable that the system can work on any hardware and any Operating System (OS).
- Compatibility of Data between the Mobile and PC: Construction managers want to handle the data in PC on the mobile device. The converse is also necessary.
- Expressivity of Display: The sufficient expressivity of drawings and pictures on the mobile device both indoor and outdoor is necessary.
- Stability of System: Total stability of system including OS, memory card and other devices is necessary.
- Operability of User Interface: Construction managers want to input data with gloves. Easy user interface such as pen-touch is suitable.
- Processing Speed: Start-up, Shutdown and each process in the mobile system needs quick response. The display speed especially of drawings and pictures is important.
- Continuous Computing Environment: The computing environment has recently changed quickly. Construction managers want to continue the use of the system for a long time. The computing environment that assures the long operation of systems is necessary.

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