SITE ENGINEER DIGITAL ASSISTANT-----THE INTEGRATION OF INFORMATION TECHNOLOGY IN ORDER TO ASSIST SITE ENGINEERS IN PROCESSING INFORMATION AT ALL TIMES AND PLACES

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Abstract: This paper describes the ineffectiveness of current methods adopted by site engineers in processing information referred to or generated during construction. The authors propose a system--Site Engineer Digital Assistant—that integrates promising information technology (IT) to improve current ways of data processing at construction site. This promising information technology is specified and the structure and characteristics of the proposed system are described for further development of a full-fledged system.

Keywords: IT, Information Technology, PDA

1 INTRODUCTION

Construction is a process that converts 3m (material, manpower, machine) to physical objects by referring to information shown on drawings, specifications, and building codes. More information (or data) is generated during the construction.

Current methods adopted by site engineers to process information, such as carrying drawings to work site for reference, recording data by hand writing or taking photo, communicating with each other via telephone or fax, are still labor intensive. Furthermore, these works are being carried out on different platforms, and most of platforms suffer from lack of mobility. This practice makes it difficult to process information at all times and places.

Evolving information technology brings new solutions. This paper points out the ineffectiveness of current ways of information processing at construction sites and proposes their corresponding IT solutions.

2 CURRENT WAYS OF INFORMATION PROCESSING AT CONSTRUCTION SITE

2.1 Information access

During construction, site engineers have to refer to drawings and specifications all the time. The bulky nature of paper documentation hinders the timely reference to this information. Furthermore, re-filing is not always properly done due to the human nature of this job. It has been estimated that near one third of the working time is spent on nonproductive activities, such as finding, copying, and filing documents.

Besides information insider companies, there is a lot of useful information related to construction methods, material quotes and etc., spreading over the Internet. Before IT matures, it is inconvenient to access this outside information, thus hindering any improvement in the work.

2.2 Data collecting

Data generated during construction, such as inspection and test data, is essential for afterwards design and construction. It is most common to pencil it down or take photos at construction site, then key in to computer after site engineers go back to office. This double procedure cannot effectively provide useful information to get timely feedback on design and construction.

2.3 Communication

At every stage of construction, communication among team members is essential. Without good ways of communication, people and information are going to waste time in travelling.

2.4 Positioning

In certain occasions, site engineers need to know the coordinate of certain positions in a quick and inexpensive way. For example, the precision of construction could be

highly improved if the established control points could be checked regularly with the help of convenient positioning methods.

3 IT SOLUTIONS

3.1 Information Access

Drawings, specifications, photos and other forms of document could be generated or converted in digital form for easy carrying and preservation. Furthermore, digital documentation can be organized, sorted and auto-refiled using database techniques. On the other hand, the use of Internet technology reduces costs and times of getting information from outside the company.

3.2 Data collecting

Hand writing input, image, digital sound recording and barcode sensors expedite data collecting. Besides these methods of active data input, site engineers can receive information transmitted from equipment or devices via bluetooth or infrared transmission. Data collected is then sent to back office for further interpretation and processing via wireless telecommunication and Internet.

3.3 Communication

Broadband technology allows large amount of voice and data to be transmitted at the same time. Useful video conferencing applications allow parties of a team to discuss face-to-face, effectively reducing the waste of time generated when people and documents are traveling back and forth.

3.4 Positioning

Utilizing a Global Positioning System, site engineers could quickly know the coordinates and the elevation of one certain position. Coupling with GIS (Geographic Information System), the position could be spotted in an electronic map and accompanying information could be referred to (e.g., information regarding any certain position).

4 SYSTEM STRUCTURE AND CHARASTERISTICS

Site engineers expect an easy-to-carry, multi-functional platform for processing site information. The authors propose an integrated system-- Site Engineer

Digital Assistant—whose structure is shown in Figure 1. The right-hand side lists possible sources of information, such as inside company databases, databases on the Internet, signals from GPS, and signals from Blue Tooth installed devices. Information can be entered via handwriting, digital filming, digital recording, barcode sensors, IC card sensors, modern transmission, Blue Tooth transmission and infrared transmission. The core of the system is modularized in order for each section to function individually and be reassembled for different needs.

The user interface should be graphical for comfortable use. Figure 2 shows the system home page, where possible subsystems are listed. Figure 3 shows the site subsystem, which is in the form of an electronic map, and figure 4 shows the office subsystem, which looks like a file cabinet. Tapping graphic elements on the screen with the stylus, users can either get down to subsystems or get certain operations done.
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5 SYSTEM DEVELOPMENT

The system is to be developed in three stages. At stage 1, a prototype system is to be developed for demonstrative and evaluation purposes. A software developing team, who won the IEEE second place prize with the work of a personal health management PDA system, is collaborating with the authors in the development of the prototype. At the same time, the authors will strive to develop an optimum workflow for information processing, including the most acceptable input formats and user interfaces. At stage 3, a full-fledged system shall be developed with the collaboration of hardware and software manufactures, which will adapt it to practical purposes.

6 CONCLUSTION

Construction industry falls far behind other industries in the use of new technology for improving productivity. This paper sheds light on the use of IT in order to fulfill the needs of efficient information processing at construction sites. A prototype is under development and evaluation. It is expected that time and energy saved out from information processing could be spent on the construction itself. That is also the essence of E-Construction
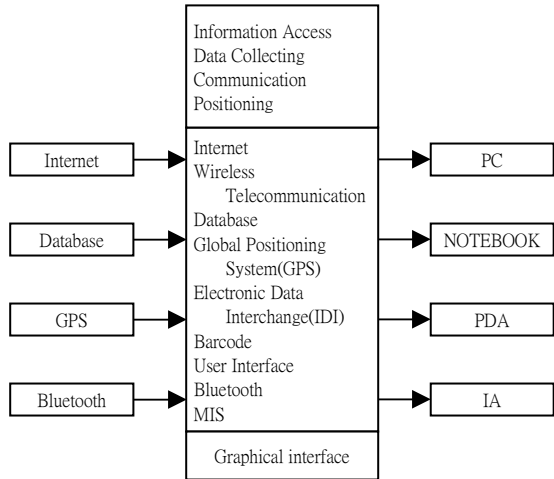
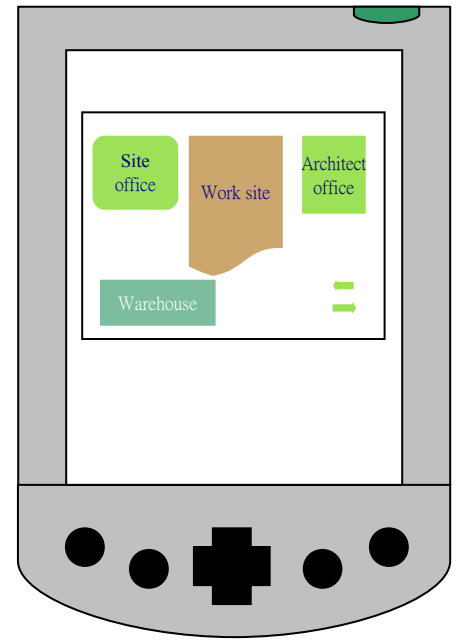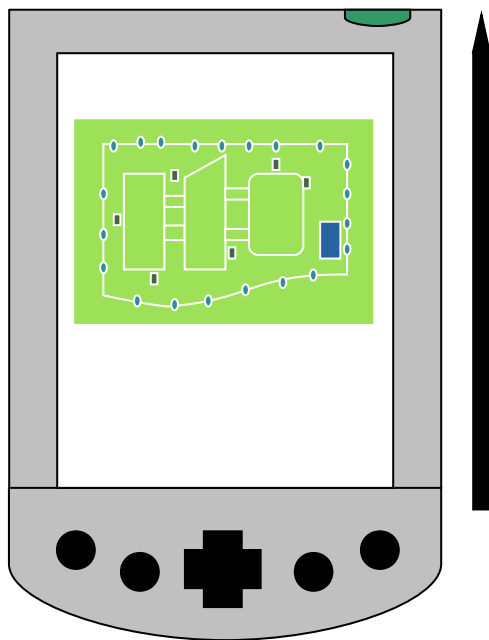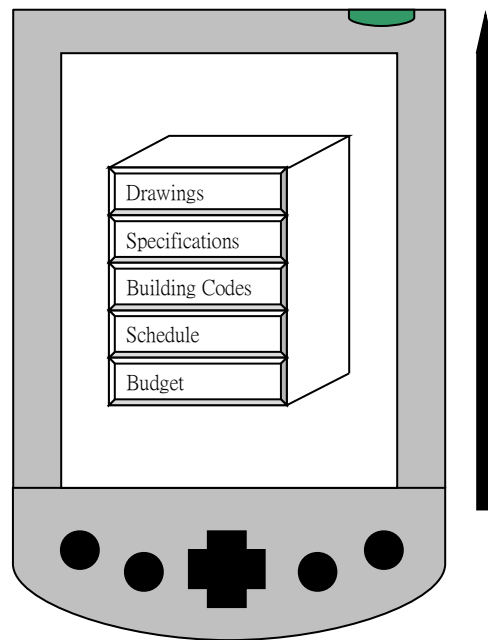Figure 1. Structure of the Proposed System

Figure 2. System Home Page

Figure 3. Site Subsystem

Figure 4. Office Subsystem