Advantages And Disadvantages Of Mobile Technology Implementation

Advantages Of Mobile Technology Implementation

With the introduction of laptops into the work environment as a substitute for personal computers, the potential of the mobile worker became evident (Bowden et al, 2005).

i. Reduction in construction time

Mobile technologies can help to minimize time and also cut capital cost in the construction industry (Bowden et al., 2005). The benefits of the provision of mobile technologies is to point of the activity workers include: doing away with retyping/redrafting, minimizing travel time in order to retrieve information and cut travel time to viewpoint of actions or activities.

ii. Reduction in operation and maintenance costs

Mobile technology can help reduce operation and maintenance cost by improving upon the efficiency of workers. As well gather and provide information throughout the life cycle of a building or structure. Network Rail's London, North East and East Anglia Region in construction industries are using a PDA, GPS and GIS system to perform their earthworks checks as look at the integrity of their embankments and cuttings. Network Rail's is currently collected data from the inspections team every week, and waiting till the end of a 4-month inspection. This allows Network Rail's to proactively organise their workload systematically. Getting Data using GIS can easily be grouped by condition enabling the identification of all 'poor' earthworks, including their location (automatically recorded by the GPS). A maintenance team can then be instructed to rectify groups of faults in a single pass. Within 1-year Network Rail achieved benefits for the solution (Bowden, 2004).

iii. Increase in productivity

The measure of the rate at which work is performed is called 'productivity'. It is ratio of production output to what is required to produce it. The measure of productivity is defined as a total output per one unit of a total input. Productivity is increased if it takes fewer resources to do the same amount of work, or the same number of resources can achieve more. Several of the national construction change initiatives promote the use of information technology as a tool to increase productivity, through automating tasks and enhancing collaboration. Task automation provides the following productivity enhancements:

- delivery of required information (e.g. method statements)
- production of reports (e.g daily progress reports)
- alerts (e.g. notification of safety hazard)
- data collation, reduces number of administration staff required.

If one area where significant losses in productivity occur is downtime on-site due to unforeseen

problems. The opportunity for mobile technologies to provide immediate access, from the point of activity, to the personnel which may be able to resolve the problem has been an ongoing subject of research (Ballard and Howell, 1994). The Last Planner system has been set up to facilitate this method of planning and its toolset includes:

- collaborative programming
- weekly work plan meeting
- long-ahead meeting

The premise is that better planning improves productivity by reducing delays, getting the work done in the best constructability sequence, matching manpower to available work, and coordinating multiple interdependent activities

iv. Increase in predictability

The following reasons methods of procurement, communication issues and culture might delay in project delivery and over budget. This section of the industry could be transformed by using mobile technology to provide precise real-time progress and cost information as the project progresses. In the above sections it can be observed that communication enhancement from one phase to the other became possible and in some situations have been achieved by most of the construction industries. The following Mobile applications are already in use progress reporting, timesheet, materials management and plant utilisation. This should now pave a way for most construction industries to compare and contrast planned programmes or budget and use this information in future projects.

Disadvantages Of Mobile Technology Implementation

Though the above benefits of mobile technology show a headway for most construction industry in using mobile technology there are several challenges faced by the industry that needs to be addressed.

i. Hardware for Mobile Technology

Handheld computers, lightweight and compact laptops have come into extensive use over the past few years; other devices like wearable computers are also making great impact as well. Where improvement has been sluggish the integration of mobile hardware seams to bridge a user’s desktop, activities while mobile, and the Internet. There are four basic issues that complicate implementation and design (Satyanarayanan, 1996). In relation to static element mobile elements are resource-poor in terms of weight, size and power. Due to the transmission of data through open space mobile communication are vulnerable to security violation. In addition, wireless connectivity is very unpredictable in reliability and performance. Finally, mobile elements must rely on limited energy sources. It is important to note that these issues are not artefacts of current technology but are intrinsic to mobility. Collectively, they complicate the design of mobile technology systems. As a result, even though important research progress has been conducted, the implementation and design of mobile computing systems still remain a problem.

ii. Location-Sensing

One of the most widely used location-sensing today is the Global Positioning System (GPS). Using time-of-flight information derived from radio signals broadcast by a group of satellites in earth orbit. GPS makes it possible for a relatively cheap receiver (on the order of $100 today) to deduct latitude, longitude, and altitude to an accuracy of a few meters (Hightower and Borriello, 2001). The U.S. Department of Defence maintained the expensive satellite infrastructure, but with the investment been made many civilian benefits from it. Without a doubt, the past few years there has been a real sudden increase of GPS-based services for the consumer market. Although GPS is certainly important its location mechanism is not universally applicable. It cannot function indoors, particularly in places where there are steel-framed buildings and for many applications its resolution of a few meters is not adequate. GPS requires coordinates relative to specific objects whereas some applications (e.g., guidance systems for robotic equipment) use an absolute coordinate system. Further, the specific mechanism required for GPS impose cost, energy use requirements and weight that are difficult for mobile hardware. Consequently, the following mechanism for tracking location (e.g., active badges, e911, and Cricket) considerably varies in their capabilities and infrastructure requirement. System costs vary as well, reflecting different trade-offs among device portability, device expense, and infrastructure needs. For applications involving mobile objects, orientation sensing (determining the direction an object faces) is also important, and this continues to be an active area of research.

iii. Wireless Communications

There has been tremendous growth in the deployment of wireless communication technologies in the past decade. Although there has been a considerable increase in data communication technologies, the most recognised one is voice communication (cell phones) which has been the primary driver. With many vendors offering hardware that supports the IEEE 802.11, wireless LAN technologies is now widely embraced in the construction industry (Williams, 2000). Although Bluetooth offers no bandwidth advantage as compared with 802.11, its standard has been backed by a number of hardware and software vendors and it is cheap to produce and frugal in power demand (Haartsen, 2000). The lowest-cost wireless technology in the market is Infrared wireless communication this is due to the fact that it is primarily used in TV remote controls. IrDA supports handheld computers, laptops and other peripherals devices like printer been used today. Infrared wireless communication must be by line of sight, with range limited to a few feet. It is also affected adversely by high levels of ambient light, such as prevail outdoors during daylight hours.

Greenhalgh claim that WI-FI network do perform well in open space when on construction site, due to the fact that when projects starts, getting wireless signals is easy but at a stage when they are boxed there seems to be interferences (COMIT, 2003). It is difficult to foresee what new wireless technologies will emerge in the future. Power consumption clearly will be an important factor for untethered devices, such as mobile computers, PDAs, and Smart Dust. In addition, it is clear that advances will be constrained by trade-offs among four factors: frequency, bandwidth, range, and density of wired infrastructure. Devices operating at a higher frequency could have greater bandwidth but would require major advances in high-frequency very-large-scale integration (VLSI) design. Advances also will be constrained by policy decisions on frequency usage (spectrum allocation) by the Federal Communications Commission. Range is fundamentally related to transmission power, but generating high power at high frequency always has been a difficult technical challenge. This is not a short-term

annoyance but a core, long-term requirement of successful system architectures

iv. Privacy and Trust

Mobile computing and distributed systems have been experiencing problems when it comes to privacy and this is greatly complicated by pervasive computing. Smart spaces, surrogates monitor and location tracking are mechanisms used on a continuous basis. As a users keep on depending on these pervasive computing systems, they get more knowledge about the behaviour pattern, habits and movement. Utilising this information becomes vital to successful proactivity and self-tuning. In addition, unless the information used is strictly controlled, they will be unsafe from targeted spam to blackmail. Indeed, the constant loss of confidentiality will discourage users from using the computing system. Greater dependence on mobile communications on site means that users should have confidence in that infrastructure to a considerable extent. On the other hand, the infrastructure has to be confident enough to authorise and identify users credentials before responding to request. It is very challenging to create this mutual trust in a manner that is minimally intrusive and thus preserves invisibility. Privacy and trust are likely to be enduring problems in Mobile communication technology in the construction industry.

Conclusion

The current usage of mobile communication in the construction industry brings many change improvements wished for within the industry by enabling point of activity workers to participate in the electronic flow of information using mobile technologies. Although this is not the only solution to the problems to be addressed, it does offer the potential of significant impact in reducing construction time and cost, defects, accidents, waste

Conclusions

The aims of this paper were to discuss the application of mobile computing in the construction industry and to report the progress of an ongoing doctoral research. The development of mobile computing has three major steps: distributed computing, mobile computing, and pervasive computing. Computer infrastructure has been transferred to site offices, but not to the construction worksites, which leads to inadequate onsite IT support. The concepts and ideas of pervasive computing, the next stage of mobile computing, has great potential to support site information communication and the ability of systemic integration for different devices, technologies and services. From the review of previous research, it was found that most studies in the area of mobile computing in construction are focused on the aspects of technologies or information systems rather than the human factors. The focus of this doctoral research is on users' perspectives and the exploration of opportunities in site information communication that can benefit from the use of mobile computing. The proposed methodology consists of three steps: a pilot case study, a Web-based survey and a well-designed experimental scenario. The completed pilot study has identified key roles on construction sites, classified their information needs, and suggested current state of onsite IT support. Findings from this case study can be used to explore the potential difficulties and limitations of site-based research and provide insights into the design of the survey.