

Tablet and Wearable Computers for Integrated Design and Construction

George Elvin

American Society of Civil Engineers Construction Research Congress, Honolulu, March 19, 2003

Abstract

Integrated design and construction teams rely on rapid information exchange between the design office and the point of work on site during construction. But existing means of communication are not compatible with the rugged setting of the construction jobsite, where both paper documents and electronic equipment may be easily damaged or destroyed. Recent advances in rugged, affordable, portable computers promise to dramatically improve communication between construction personnel at the point of work on site and their off-site collaborators. Using a wireless-enabled tablet or wearable computer, a field worker can access the project information needed to complete a task without ever leaving the point of work. Pen-based tablet computers are becoming a popular alternative to keyboard-input notebook computers. Wearable computers are in use today by emergency medical personnel, firefighters and others requiring extreme mobility and instantaneous information access at their point of work. In the experimental phase of the project we designed and constructed three small structures, each employing a different communication technology – paper, tablet computer, or wearable computer - while other variables in the project were held constant. In each experiment, a research assistant acting as constructor was required to collaborate with a remote designer. In each case, the constructor began the project with only 30% of the information required to complete the project, requiring extensive communication between designer and constructor.

Using a wearable computer rather than paper documents for information exchange in building construction reduced rework by 66%. If this result may be applied to the construction industry as a whole, where rework accounts for 12% of total construction costs, the use of wearable computers could reduce total construction costs by 8%. Using a tablet or wearable computer did not significantly reduce the amount of time spent on communication. But the reduction in rework suggests that, while the tablet and wearable computers did not reduce the quantity of communication, they may have improved its quality. We therefore consider the initial research hypothesis that tablet and wearable computers can improve communication between the fieldworkers at the point of work on site and off-site collaborators in building design and construction verified. If tablet and wearable computers do improve project communication, this may lead to a more efficient design-construction process and to savings that may be dedicated to improving the quality of our built environment.