Digital Hardhat System

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**DIGITAL HARDHAT SYSTEM**

**The Need**

The cost and time required to travel between construction sites limits the ability of personnel to quickly respond to problems at remote sites and to communicate issues between all necessary decision makers. Also, it is difficult to organize and transmit multimedia project information (digital pictures, video, electronic documents, and audio recordings) so that others can access current project information in an intuitive and timely manner. The Digital Hardhat (DHH) technology enables dispersed users to capture and communicate multimedia field data to collaboratively solve problems, and collect and share information. The DHH is a pen-based personal computer with special Multimedia Facility Reporting System software that allows the field representative to save multimedia information into a project-specific database, which is then accessible to others through the World Wide Web.

![Figure 1 The Digital Hardhat in use](image)

**The Technology**

The Digital Hardhat (DHH) is a pen-based personal computer (PC) running a Windows operating system, which is used to collect multimedia information such as text, sound, video, and images. This pen-based computer can also be used to communicate between the construction site and other locations using various connection methods including a wireless network connection, which enables a personnel to roam around the site and video teleconference live with others to solve problems collaboratively. In addition, special software called Multimedia Facility Reporting (MFR) System allows the field
representative to save multimedia information into a project-specific database accessible through the internet. The project information collected through the system will help document site conditions, progress, and problems in an organized manner so the information can be retrieved easily as needed by any project participant. In the application of this system, immediate reductions in travel cost will be the most obvious benefit; however, costs associated with more quickly resolving issues, reducing construction claims, and fewer time delays will be the ultimate benefit of this technology.

![Figure 2 The mobile unit and a hardhat](image)

Digital Hardhat based collaboration systems can be configured in the following ways:

- Remote construction field office. The original Digital Hardhat paradigm (standalone system with MFR project server, wireless network, pen-based computers for data collection and collaboration, and communication lines to District or other co-workers) is suitable for large, remote project sites.
- For mobile teams, a good option is to set up a MFR project server inside the District (or other office) firewall, so mobile workers can dial in or use the Internet to update project files and collaborate with co-workers.
- Distributed MFR project servers located on networks at customer locations. MFR project servers could be set up at a location where many smaller or several large projects are under construction. Site representatives could capture multimedia data describing current project conditions and update the MFR project database.
- Remote unattended video capture devices for use on construction (or other) sites so Corps personnel can periodically keep track of project activities.

In all of these cases, customers, contracting officers, project managers or other approved team members could access current project conditions using the secure MFR web site, instead of calling team members on
site and asking questions. It would be possible to set up a method for posting issues, modifications, clarifications and change orders on the web site so decisions could be documented quickly and construction could proceed.

**The Benefits**

- The DDH system improves the documentation of site conditions by integrating multimedia and database technologies.
- Structured organization of project information provides easy and timely retrieval for fast and accurate decision making and problem solving.
- Easy availability of multimedia project information reduces frequent travel and telephone expenses between District offices and construction sites.
- Video conferencing and whiteboarding on the internet improves the collaboration of project participants by sharing construction information in multimedia formats.

![Figure 3 Using a whiteboard](image)

**Status**

CERL (Construction Engineering Research Laboratories) conducted a field test of the Digital Hardhat in conjunction with the University of Illinois at Urbana-Champaign and the U.S. Army Medical Command Support Team at Fort Worth District between June 1997 and December 1998. The digital Hardhat system (including hardware, software, and communication devices needed) was installed to enable mobile team members to keep track of projects at remote facilities. Web-enabled multimedia database management software (MFR) was developed so mobile team can capture accurate site conditions (text, video, sound, or
images) into a multimedia database that can be accessed from a web site using network connections. After the successful prototype development, the research team has been working with commercial hardware and software companies on developing hand-held pocket PCs with integrated imaging, multimedia, and wireless capabilities.

**Barriers**
- Ruggedness of computer at construction site
- Screen display outdoors
- Cost
- Worker training

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**References**

**Reviewers**
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