

Site design problem resolution

Users	Operatives & consultants
Location	On site & consultant's office
Solutions	Few
User benefits	High
Org. benefits	High
Implementation	Hard



Process description

When a problem is encountered on site there is often a need to refer the problem back to the consultants in order to resolve the issue.

The person that discovers the problem reports it to his/her superior and then it is reported to the person responsible for liaising with the consultant. An RFI is then raised and sent to the consultant. He/she reviews the information received and determines if a site visit is required and authorised. If a visit to site is required then there will often be significant travel time incurred to and from the site.

Once the consultant has sufficient information to provide a solution or authorise the contractor's proposed solution he/she will respond to the RFI and raise a site instruction if required.

Background

Site issues need to be resolved quickly and efficiently to avoid cost overruns and this often requires collaboration between on and off-site personnel.

This process involves several different parties; the person discovering the problem, the people in the reporting hierarchy, the design liaison and the consultants. These parties are all at different locations and work for different departments/companies.

Differing locations is the main issue in this process. Often the consultant can work some distance from the project, sometimes even in a different country. The information that can be provided verbally or in writing is often not sufficient to describe the problem and a site visit is required. However, sometimes this is not authorised due to lack of funding and hence the proposed solution might not be the most suitable. Delays in the process are often the result of inaccurate or incomplete information as the information passes through many people on its way to the consultant resulting in "Chinese whispers".

The Contractor may have their own proposals to solve the problem but these need to be approved by the consultant and hence a similar process is followed.

Current issues

The following issues have been raised for this process:

- The consultant will often only have drawings representing the finished structure and hence will have difficulty in envisaging the current situation on site.
- There may be other issues on site that prevent the consultants solution from being realised e.g. the equipment required for the solution is not suitable or unavailable.
- The process of information flow from problem discovery to solution is often very slow.
- The consultant could propose a solution based on inaccurate information and that solution could result in even more problems.
- This process may be very wasteful of resources; sometimes there can be one clerk who spends their entire time dealing with RFIs.
- Miscommunication can result in ill-feeling between the consultant and the contractor which in turn makes the situation worse.

Mobile solutions

With the advent of camera and video mobile phones and PDAs it is possible to deliver pictorial information direct to the consultant. However, this has to be carried out in a controlled way so that the communication between site and the consultant is recorded.

An RFI form could be created for use on a PDA to enable the site engineer to capture information on a problem that has arisen whilst he is out on site. This form could provide the ability to attach pictorial information; a digital photograph or video.

Once the form is completed it could either be synchronised when the site engineer gets back to the site office or it could be synchronised via WLAN or GPRS whilst out in the field. Due to the nature of the data collected it is more important to deliver this information directly from the field such that if there are any further queries these can be addressed immediately.

The person responsible for liaising with the consultants can be notified either by SMS or email that a new RFI has been raised. He/she can then view this information on his/her PC and determine if there is sufficient information to forward to the consultant.

Once the consultant has received the RFI he/she can then instruct the site engineer to provide further information if required. At this point it may be of benefit to use a product called a digital hard hat.

The digital hard hat is a construction hard hat with added computer hardware and software. It enables the site engineer to collect video data whilst under instruction through an earpiece from the remote consultant. In this way the consultant is able to have his eye's on site without travelling there.

The hard hat will also store the conversation that occurs and using voice recognition software can add this to the content of the RFI.

A simpler alternative would be to continue to use the video enabled mobile phone, however, capture of the conversation would be more difficult and the image quality may not be as good.

Benefits of mobilisation

The ability to generate an RFI in the field shortcuts the hierarchy chain back to the person who liaises directly with the consultant. This eliminates many of the problems associated with "Chinese whispers". It also enables the person who spotted the problem to immediately supply additional information if required and eliminates the need for them to return to the site office.

Collection of RFI information electronically at source provides contemporaneous information and eliminates errors typing up information from handwritten notes or from memory. It also allows the site engineer to spend more time out on site undertaking work that enables the project to be completed on time and on budget.

The provision of pictorial information to the consultant from the field provides additional information that may not be able to be provided verbally or in writing. It also provides additional information that the contractor may not have thought to provide. For example the problem in question is situated directly underneath an overhead power line and hence this limits the usage of certain types of equipment, this may be spotted by the consultant in the pictorial information.

Ease of implementation

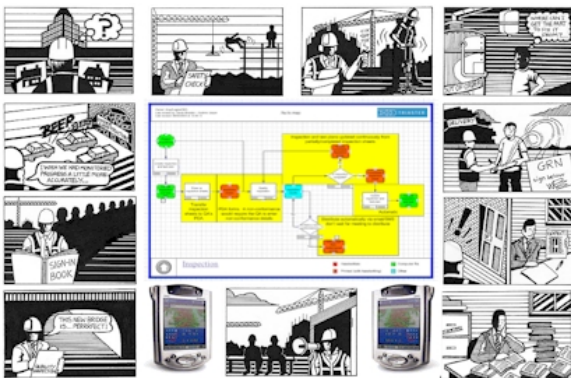
The digital hard hat has been the subject of research since the early 1990s. However, its acceptance on site has been an issue with the 'cyborg' image conjured up. The technology required for efficient transfer of this information has not been readily available until now. However, Woh Hup Private Ltd, a construction company based in Singapore, are currently involved in a \$2 million programme to develop a commercially viable digital hard hat.

In the nearer future mobile phones and PDAs with the capability to capture video and the 3G infrastructure required to support the transfer of video will become more widely available. The first of these phones was launched in early 2003 and now there are several models available. However, currently the cost of transferring this information is relatively high.

Process improvement through the introduction of Mobile IT

Accompanies To-Be map
As-Is map
Narrative

Available from www.comitproject.org.uk



Summary

The construction industry's drive towards utilising IT to enhance communication both within a company and between clients, consultants, suppliers, subcontractors and contractors has, to date, ignored the need to deliver information effectively to mobile personnel e.g. whilst on site or attending a client meeting.

The advent of suitable devices and software solutions will go some way to correct this. However, simply because the technology is now available we should not be indiscriminate in choosing the processes to apply it to.

This report documents the activities undertaken to better understand which construction processes would derive most benefit from the application of mobile information and communication technologies.

Introduction

An initial review of existing research and applications of mobile IT in construction was undertaken; The Current Status of Mobile IT. You can download this report from www.comitproject.org.uk.

The COMIT community, 30 representatives from the construction and technology industries, were then presented with a list, derived from previous research, of processes that Mobile IT could improve.

Ten processes were chosen to look at in detail in order to determine which processes would benefit from the introduction of Mobile IT. These were:

- Drawing distribution and usage
- Monitoring progress
- Monitoring health and safety on site
- Quality inspections
- Task allocation
- Goods received notes
- Site design problem resolution
- Site diaries
- Onsite accounting of operatives/visitors
- Maintenance inspections

In addition, one of the partners requested that monitoring of hazardous activities was also researched as new legislation, recently introduced by the HSE, has brought about a new requirement to monitor and record this process.

Generating the process maps

Process maps were produced to show how the processes occur currently; the "As-Is" maps.

Companies from within the COMIT community and relevant external contacts were asked to provide any material they had relating to each process; this included project procedures, existing forms, and QA documentation. This was supplemented with a literature review of research carried out in this area.

Material was received from 25 companies including most of the major contractors. This was then used to produce generic "As-Is" process maps for each of the 11 processes.

Using the "As-Is" process maps, activities were identified which could be improved through the use of Mobile IT. These areas are annotated and highlighted in yellow on the maps.

Five of the COMIT companies attended a workshop to ratify the "As-Is" process maps and the areas highlighted for improvement.

Once the "As-Is" maps were finalised these were taken as a basis for the "To-Be" process maps which illustrate how the processes could be enhanced using Mobile IT.

Through the use of Mobile IT, data can be collected electronically at the point-of-activity. This results in many of the highlighted activities being automated, thus reducing substantially the time spent producing reports and transferring information.

Additionally the quality of information collected and hence produced is increased due to the lack re-keying and data entry errors.

The narratives

A narrative has been produced to accompany each set of process maps. This provides an overview of the process, the issues that are present with the current approach, ideas for mobile solutions, details of the benefits that they bring and an assessment of how easy the solutions would be to implement.

These have also been ratified by the COMIT community.

Mobilisation "scores"

A subjective assessment has been made of the how widely relevant solutions are available today, the benefits to the end-user, the benefits to the organisation and the ease of implementation.

These "scores" (red, orange, green) are given at the top of each process narrative to provide information at a glance and help you to decide which processes should be considered for the implementation of Mobile IT.

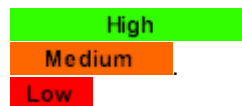
Solutions

An assessment of available solutions is made in accordance with how many solutions are available, their affordability, and are they in current use in the construction industry and/or will they require customisation to suit the particular process under consideration. The scores given are:



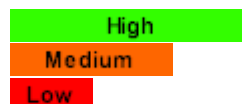
User benefits

For any mobile solution to succeed it must deliver benefits that are directly apparent and of value to the end-user. This will encourage the adoption of the solution and hence help to deliver the organisational benefits. The scores given are:



Org. benefits

The user benefits will result in benefits to the organisation. In addition benefits will be derived through the collection of more accurate information, the reduction of information transfer time and the ability to search and utilise the electronic information subsequently. The scores given are:



Implementation

The ease of implementation is assessed in accordance with whether the solutions are already in use on construction or similar industries, the readiness of the users to take up the technology and the current extent of electronic information in the process. Hence a judgement can be made on the length of time and the effort that would be involved in the implementation. The scores given are:

