

Maintenance inspections

Users	Maintenance engineers
Location	On site
Solutions	Several
User benefits	High
Org. benefits	Medium
Implementation	Medium



Process description

Once a project is completed the ongoing maintenance begins. The contractor that wins the maintenance contract will receive details of the project, the operation and maintenance manual and the health and safety file. They will then carry out an initial survey in order to understand what the work will involve, how often assets need to be inspected and what level of service the client will demand.

A maintenance schedule is created which sets out how often assets should be inspected. When an asset requires an inspection a work order is issued and the inspection undertaken. Typically, these reports scores the asset under inspection, e.g. asset condition could be rated on a scale of A (new) to E (not worth maintaining, should be replaced). The maintenance reports are then completed and payment for the work is sought.

Background

This process consists of five primary sub-processes;

- Creation and updating of the maintenance schedule
- Allocating work via work orders
- Performing the maintenance inspection and carrying out any work required
- Updating the maintenance records
- Invoicing and receiving payment

At any one time the maintenance contractor will have multiple buildings for which it is providing its maintenance services. These can be located across the UK. The maintenance contractor will have one internal team and preferred sub-contractors who are responsible for the maintenance of these buildings. Each building will have multiple assets which require maintaining and hence this process is complex by virtue of its sheer magnitude.

There will be some tasks that the maintenance contractor will have the skills in house to deal with and others that they require a sub-contractor for.

The maintenance contractor wishes to organise their work in the most effective way and hence would prefer

to use maintenance engineers that have the least distance to travel to the building is question.

Currently although there may be in-house systems for recording maintenance activities the distribution of tasks and the collection of data in the field is still very paper-based.

Current issues

The following issues have been raised for this process:

- Need to know instantly who is closest to the building in question and has the skills required to undertake the maintenance
- The distribution of paper work orders and maintenance records is time-consuming and can cause significant delays
- Lack of information in the field can result in needless travel back and forth to the office
- Control of the operatives in the field is difficult at a distance and their autonomy can be abused.
- Maintenance records can be lost or difficult to read and input into the central system.

Mobile solutions

There are three distinct areas in this process that mobile technologies can be used to address; the delivery of work orders to the field, the collection of maintenance information and locating spare parts and equipment.

Delivery of work orders to the field

The maintenance engineer could be sent their work orders directly to their PDA via GPRS. The work orders could be allocated according to their location and skills much in the same way that taxis are coordinated. Their location could be determined by providing their vans with GPS units.

Once the work order is completed they could acknowledge this and send back the signed off work order. The maintenance schedule could then be updated automatically.

Collection of maintenance information

A form could be created for use on the PDA to enable the maintenance engineer to capture the maintenance information whilst he/she is in the field. This could be distributed over the network such that each time the site engineer collects his/her PDA it is pre-loaded with the maintenance record for the asset and the maintenance inspection form which will have certain fields completed already e.g. asset number. Alternatively this information could be stored with the asset itself by RFID tagging it.

Digital photographs could be captured when the asset to be maintained needs replacing or repair and the maintenance engineer requires authorisation to do so. These could then be sent back 'live' to the maintenance contractor who could quickly authorise the additional work required.

Once the form is completed it could be synchronised via GPRS whilst out in the field. The data can then be fed into a maintenance database. This would enable the update of the maintenance schedule and the maintenance reports to be completed automatically.

Locating spare parts and equipment

If digital photographs are captured these can then be sent back to the maintenance contractor to aid the operative in identifying the parts that are required.

Once the parts are identified the operative could access a "where's my nearest" application which would provide information and directions for either the nearest part already owned by the maintenance contractor or their recommended suppliers.

Benefits of mobilisation

Knowing where the maintenance teams are located at any one time can allow more efficient allocation of work orders. If a maintenance engineer finishes work on one asset and then an emergency work order is issued for an asset nearby he/she can quickly go there.

Elimination of paper work orders and inspection reports reduces delays in distributing the information and eliminates errors typing up information from handwritten notes or from memory. It also allows the maintenance engineer to spend more time in the field.

The provision of pictorial information back to the maintenance contractor enables easier identification of issues and hence immediate authorisation for work to proceed. The maintenance engineer can remain at the asset whilst this process takes place thus eliminating needless travel time.

The use of an RFID tag on assets, (e.g. HVAC systems) would allow all of the relevant information to be kept both on site and at head office. The maintenance engineer would then be able to access on site the historical maintenance reports and detailed information about the asset.

Accurate information on the time it takes to undertake maintenance work can be collated and this can then be used both for verifying payment and revising the maintenance schedule accordingly.

Ease of implementation

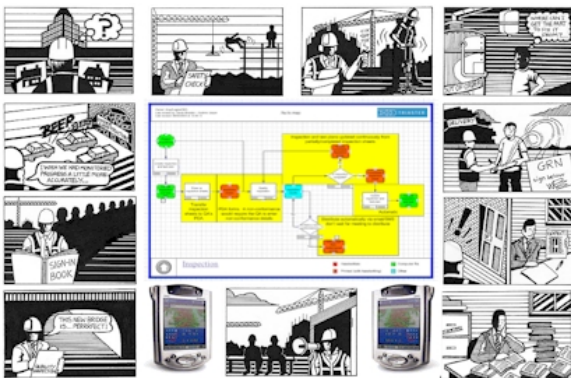
Most maintenance contractors will already have an in-house or off the shelf system for planning and keeping records on their maintenance work. The mobile solutions proposed here are simply extensions of these systems and hence should be relatively simple to implement.

The technologies required are also readily available and in use in other industries.

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.

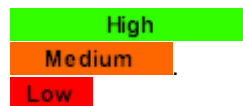
Solutions

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:



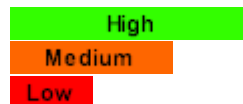
User benefits

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:

