

Quality inspections

Users	Site engineers
Location	On site
Solutions	Few
User benefits	High
Org. benefits	High
Implementation	Medium



Process description

Quality inspections are undertaken as part of quality control which aims to determine that quality work has been undertaken. Quality control is conducted by inspection and testing of materials, workmanship and product. Initially an inspection and test plan (ITP) is drawn up which details the inspections that should be undertaken and when. An inspection sheet is drawn up for each item that requires inspecting (e.g. fencing, piling). These sheets are then completed by the site engineers for each item as they become ready for inspection. If the item being inspected does not comply then a non-conformance sheet is issued and remains open until the non-conformance is remedied. All inspection data is collated centrally to ensure that all items on the project have passed through quality control.

Background

Quality control is all about conformance to requirements. These may be driven by health and safety, specifications, regulations or the client.

The monitoring of quality on site is a complex process as it requires the inspection of all of the components of the structure which is itself complex.

Items may need to be inspected more than once as they are being built, especially for items that are to be buried. For example piling should be inspected to make sure they are set out correctly, that the reinforcement has been installed satisfactorily, that the concrete has been tested etc. This requires the inspections to be scheduled in accordance with the project programme.

In addition, there is a sub-process for resolving non-conformances, which involves multiple personnel and has to be completed in order for the quality inspection to be completed.

Current issues

The following issues have been raised for this process:

- Currently site engineers often remember the inspection information and only write it down when they return to their site office. Hence there is a high potential for mistakes.
- Inspections can sometimes be missed altogether as the item to be inspected is no longer visible.
- It is common for non-conformance reports to be filed on disparate site servers and they are therefore difficult to locate.
- Operatives may fix the problem themselves and not report it. This problem could then occur again and again rather than be prevented.
- Operatives may try to put the problem right themselves making things worse; simple problems may escalate if they are not addressed in time.

Mobile solutions

Electronic forms for inspection sheets and non-conformances could be provided for completion on a PDA. The data collected on these can be transferred to a central database. This would enable even information from partially completed inspections to be available centrally.

Digital photos could be taken or sketches drawn on the PDA. These could then be attached to the quality inspection or to the non-conformance report in order to provide additional information/evidence.

This information can then be used to update the ITP automatically to show the progress of inspections. Ideally this would be in the form of a graphical representation showing on different layers the items to be inspected e.g. drainage, brickwork, pavement. Colour coding could then be used to show items not ready to be inspected, items ready to be inspected and items inspected. This would then highlight inspections that are overdue. Automatic alerts could then be sent out to site engineers informing them to undertake an inspection.

Once a non-conformance is raised on the PDA (would automatically ask to be completed if the inspection is not OK), then this is added to the non-conformance register which is automatically generated. Team leaders are alerted via email or SMS of the non-conformance and they are then able to send an email or SMS to the person responsible for resolving the non-conformance. Once the non-conformance has been resolved this confirmation can be sent via SMS and then an alert via SMS/email sent to the site engineer to ask him/her to recommence the inspection.

Benefits of mobilisation

All of the inspection sheets can be stored on the site engineers PDA or be available for download via GPRS or WLAN. This enables the site engineer to undertake inspections as he/she sees items ready to inspect.

Information from the inspections is collected and recorded at the point of activity hence providing more accurate information and eliminating transcription errors.

The provision of a digital photograph as well as the data provided in a non-conformance report enables the team leader to make a better decision as to what

remedy is required. This information can also easily be passed on to the consultants for their input if required.

Additional supporting material can be easily provided to help the site engineer undertake the inspection, e.g. expected slump test results, or the relevant drawing.

Information from partially completed inspections can be made available centrally. Currently only completed inspection forms are sent back to the site office to be filed and the ITP updated accordingly.

Cross referencing between non-conformances and inspection sheets is produced automatically and a hyperlink can be provided to ensure easy access.

The collation of quality inspection information centrally can allow trends to be spotted and hence reoccurring problems with quality can be addresses so that the work is done "right first time".

Ease of implementation

There are currently no mobile applications specifically designed for conducting quality control inspections in construction. However, there are several mobile applications for conducting snagging inspections once the building reaches practical completion.

Many different forms would have to be created to take account of the many different items that need to be inspected.

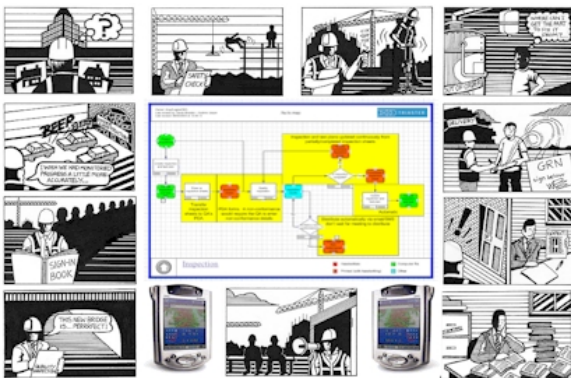
Quality inspections are seen by some as simply a mountain of paperwork that has to be completed. By providing simple forms that can be filled in whilst the site engineer is on site undertaking his/her work would enable the inspections to be undertaken in smaller chunks and hence be more attractive and more likely to be completed contemporaneously.

The links to update the ITP according to progress made and inspections undertaken would be more difficult to implement, however with the advent of the 3D project model and a more data-centric approach this would become much more easy to implement. At this stage however, a simple database report could easily be produced highlighting the areas ready for inspection and the inspections already undertaken.

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.

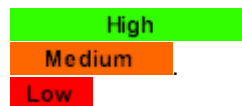
Solutions

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:



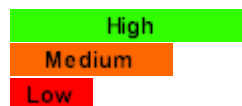
User benefits

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:

