Uppkopplad byggplats White paper: NCC Säkerhet

Modernised Inspection Process

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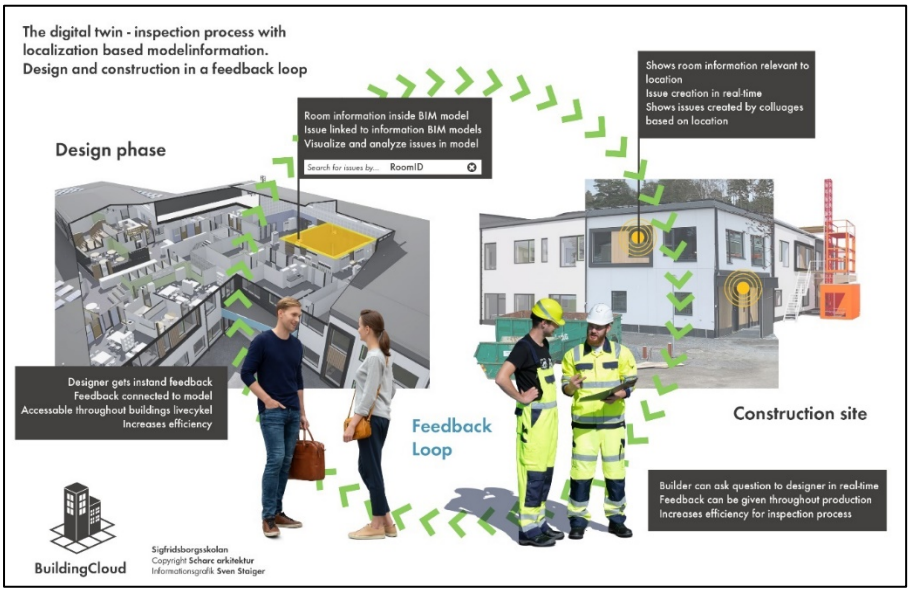
SMART BUILT ENVIRONMENT
UPPKOPPLAD BYGGPLATS



Modernised Inspection Process

Increasing efficiency of the inspection process with issue management and localisation functions

Ahmet Anil Sezer and Martin Rudberg

In NCC's project, Sigfridsborgsskolan in Nacka, a new inspection process was tested, relying on two functions, localisation and issue management.

With support of existing technologies including Beacons, tablets and a cloud-based information management system, the goal is to modernise the inspection process to make it more productive and less time consuming. In overall, site management personnel found this new method very useful, easy to learn and simple to use. Technology does not only reduce the time during inspection but also after the inspection, helping site management personnel to categorise the issues and assign them to related actors to be fixed.

This test project is a result of collaboration between NCC, Scharc and Linköping University.

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1 The challenge

1.1 Background, aim and the need

The construction industry suffers from low productivity while certain activities, including inspection process, can become more efficient with support of new technologies. The traditional inspection process can be divided into two steps, pre-inspections carried out by site management of the construction project and official inspection carried out by an external inspector. Pre-inspections start with site management personnel walking around the building and inspecting every room, recording issues, informing relevant subcontractors or professionals to fix these issues and getting feedback from them when the issues are fixed. The aim with this test is to modernise the pre-inspection process on construction sites.

The system being tested here relies on a combination of different technologies. Beacons and tablets were used as hardware while a cloud-based information management system called BuildingCloud was used as software. The hardware was standard OTS products, while BuildingCloud is developed and provided by the Scharc Group. For the inspection process, BuildingCloud basically allows construction site management personnel to report issues in a simple way, by relying on two functions: (i) localisation and (ii) issue management. During pre-inspections, the localisation function, aided by the installed Beacons, help site management personnel to identify the room in an easier way, while the issue management function opens up for new opportunities including pictures being added to the issues and pre-defined categories helping site management personnel to report issues in an easier way.

As for many contractors, for NCC productivity is an important issue. In this test project, NCC and Scharc collaborate with support from Linköping University, for introducing a new technology to modernise the pre-inspection process at construction sites within the project “Uppkopplad byggplats” (Connected Construction Site) to improve productivity.

1.2 The test project

NCC’s test project leader has been active while selecting tests, technologies, and construction site for the test. NCC in general identifies construction projects that are willing to be part of the test project as well as partners who are willing to develop systems and technologies. Scharc developed the system by using existing technologies and developing them further for the purpose of the test.

1.3 How were the required technologies found?

The technologies used in the test project included mainly Beacons and tablets as hardware and BuildingCloud as software. Scharc scanned the market for finding the technologies and developing them for the purpose of the test. During the tests, there has been exchanges of ideas between NCC and Scharc where improvements were made in the technologies by Scharc.

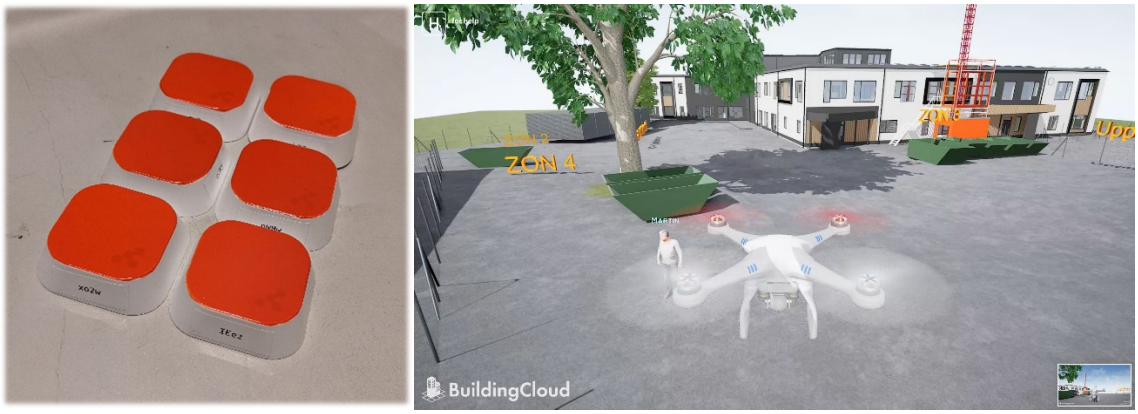

Figure 1: Beacons and BuildingCloud walk through

2 Information about the test

The tests were run at NCC's project, Sigfridsborgsskolan in Nacka. NCC is building two schools in parallel for the municipality of Nacka for a total of 1500 students. The project is a part of strategic partnering agreement which includes developing preschools, schools, and sport halls for the municipality.

Participants involved in the test project were:

- Main parties:
  - NCC, Scharc
- Other parties:
  - Linköping University
- Key people/roles in the test:
  - NCC: Testbed responsible, site manager, site supervisor and VDC developer
  - Scharc: CEO, real estate developer and IT-manager

3 Results from the test

3.1 The solution

Compared to traditional inspection process, the modernised inspection process relies on two main functions, issue management and localisation. The issue management function allows site personnel to walk around the building during the inspection process with a tablet and create issues whenever they notice a problem. While creating issues, the personnel can use pre-defined categories, add pictures and assign these issues to related subcontractors or site personnel. When the actual inspection is done, site management can export the issues on an excel file, filter issues according to the roles who should fix them and inform these actors quickly.

The localisation function supports the issue management function. Beacons are installed in every room of the building which allows site personnel to see which room they currently are at, during the inspection (see Figure 2). Moreover, the room information can be added automatically to the issues.

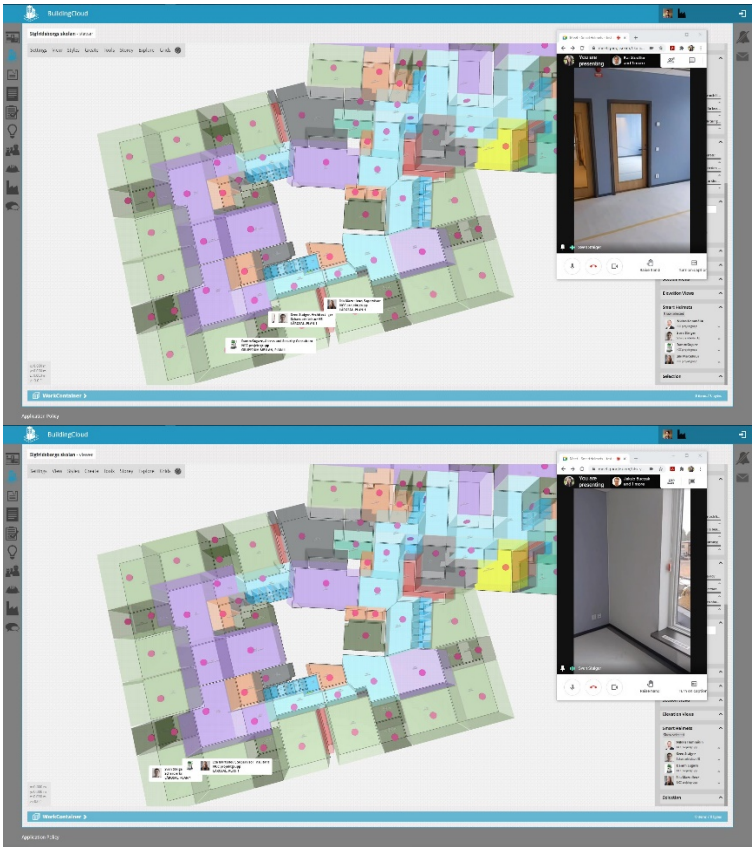

Figure 2: Test of localisation function

3.2 Effects and results

The modernised inspection process was found useful and especially easy to use. Effects and results can be summarised as following:

- Instead of taking notes on a paper-based drawing in traditional inspections, tablets are being used in the modernised inspection process
- While creating a new issue, the system requires less buttons to be pushed compared to other systems, which is very useful and requires less time
- Being able to take pictures and attach them directly to issues is very useful
- By using the digital drawing on the tablet, one can click on the room and enter an issue, which does not require the person to enter the room info
- Exporting the inspection protocol to excel gives site management the opportunity to start fixing the issues already in the same day
- The modernised inspection process is easy to learn, and is expected to take 5-10 minutes of basic instructions to start to use it
- The new process does not really affect the inspection itself but instead it facilitates what happens after the actual inspection. In this test, it took only one hour to go through the inspection protocol and 10 minutes to assign/e-mail these issues to the related actors to fix

3.3 Requirements and challenges

During the test project, Scharc has been very active, noting issues reported by the test participants in weekly meetings and upgrading the technologies accordingly. The requirements and challenges in this test project can be categorised as technical and organisational ones.

The technical requirements and challenges were:

- Internet connection created some difficulties during the inspection process, slowing down the site management while reporting the issues in the system
- Using pre-defined categories was not as easy as planned
- There were minor problems in setting up the pre-defined categories where site management recommended certain pre-defined issues, however, in reality there were some other issues. So, there is a room for development, considering the type of inspection carried out.
- In order to print out the inspection protocol, it is first exported to the excel. There were minor problems with the structure of the exported list which is being fixed by Scharc

- When the inspection protocol is exported, it only shows the room information and does not allow it to be exported on the drawings. Exporting the list on a drawing or encouraging other site personnel to use tablets so they can see issues on the drawing will be useful
- Having less buttons to click during issue management was great but this can be developed even further, reducing the number of clicks even more

The organisational requirement and challenges can be summarized as:

- The external inspector is not using the system and site management is legally obliged to report to the external inspector, in the way the external inspector prefers. This leads to double processes. By making the external inspectors use the same platform for inspections and solving legal issues such as adding digital signatures, double processes can be eliminated.
- The subcontractors and site personnel prefer to have the inspection protocol on paper, printed out
- The webpage for BuildingCloud where issue management is carried out was blocked by the NCC's servers. During the test project, this problem was fixed with the use of tablets provided by Scharc

4 Learnings and "take aways"

Before and during the test, weekly meetings were held including personnel from NCC, Scharc and Linköping University. With these meetings, the upcoming tests were planned, feedback was provided regularly and upgrades of technologies were made . Scharc has been very active and visiting the construction site regularly to install the technologies, monitor problems and fix them as soon as possible during the test.

Using fact-based measures for the assessment of the test was difficult. This is because the inspection is carried out only once in the project, not allowing observation of the effects of the technology. Moreover, only two people from the site management used the technology during the inspection process. Therefore the assessment of the modernised inspection process was based on the perceptions of the two site management personnel.

5 Summary and conclusions

5.1 Results

Results of the test project can be summarised as:

- Using the issue management function on digital drawings with support of tablets made it easier for the site management personnel to insert room information as well as the other details of the issues
- Exporting the list to excel and assigning the issues to the related actors took less time compared to the traditional inspection process
- Taking and adding pictures to the inspection protocol makes it easier to identify where exactly the problem is in a room considering that some rooms can be 100m^2, which makes it difficult to find the exact location of the reported problem
- There are opportunities to develop the technology further, e.g. by making other site personnel and subcontractors use the tablets to see issues on drawings and signing them off when they are fixed. The external inspector could also use the same system, which would avoid the current double work

5.2 Most important experiences

Receiving regular feedback from the site management personnel and developing the technology based on their needs was the key in this test project. Moreover, whenever test participants identified a technical problem, it was solved very quickly, making it easier to focus on issues with larger impact instead of smaller problems. Having very ambitious and dedicated test project members from Scharc and NCC made the collaboration work excellently. The test project has been successful with both main participants finding the technology useful, easy to use and planning to use it in their future projects. Recommendations were provided to scale up the technology to other projects to be used on a larger scale.

5.3 How can the technology be implemented in other projects or companies?

The technology relies on a cloud-based information management system called BuildingCloud. However, in order to use the BuildingCloud, 3D models of the project have to exist. For the localisation function, Beacons must be installed in the building. Besides these, the modernised inspection process requires only tablets during the inspection. In conclusion, the technology can easily be used in other projects or companies.

5.4 Risks/pitfalls with the technology

There are no risks identified with the use of technology.

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