

REAL-TIME TRACKING OF PRODUCTION CONTROL: REQUIREMENTS AND SOLUTIONS

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1 BACKGROUND

Production control in construction has been mainly discussed within the scope of Lean Construction, including the Last Planner System (LPS), the Location-Based Management System (LBMS) and Takt Time Planning (TTP). However, all of the production control approaches rely heavily on social processes and manual data collection, requiring substantial amounts of human labour to collect and analyse data, which eventually was prone to human error, besides it is an expensive, inaccurate and inefficient process.

2 CURRENT CONDITIONS

- Construction sites are usually characterized by a complex set of interactions between space, equipment, labour, materials, and final product. However, with the current manual approaches, it can be said that the full potential of production control have not been achieved.
- Technology has been developed to the point where it is possible to configure a system for a truly intelligent construction site, where all resources can be tagged and located in real-time, including mobile technology and building information modelling (BIM). However, although improving construction productivity through integration and automation, real-time information about the production factors, equipment, labour, and materials, is still gathered through manual practices, if at all.

3 GOALS, TARGETS AND METHOD

The aim of this paper is to propose an intelligent construction site system for real-time production control, named iCONS. The system will be part of an international research project managed by Aalto University and supported by construction companies, software companies, operators, and international universities from four countries: Finland, USA, Brazil and China. iCONS will be developed based on the main requirements of the companies, the existing technical solutions that have been used in real-time tracking, and new developed solutions that can address any gaps.

Through literature review, face-to-face interviews and a focus group, four most relevant required themes of real-time production control were found: *1) Safety management; 2) Process information, productivity and waste; 3) Material logistics and 4) Location-based information on pull basis.* Then, an intelligent system was proposed, considering requirements, existing solutions, and solutions to be developed and tested in future research.

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4 PROPOSED REAL-TIME PRODUCTION CONTROL SYSTEM

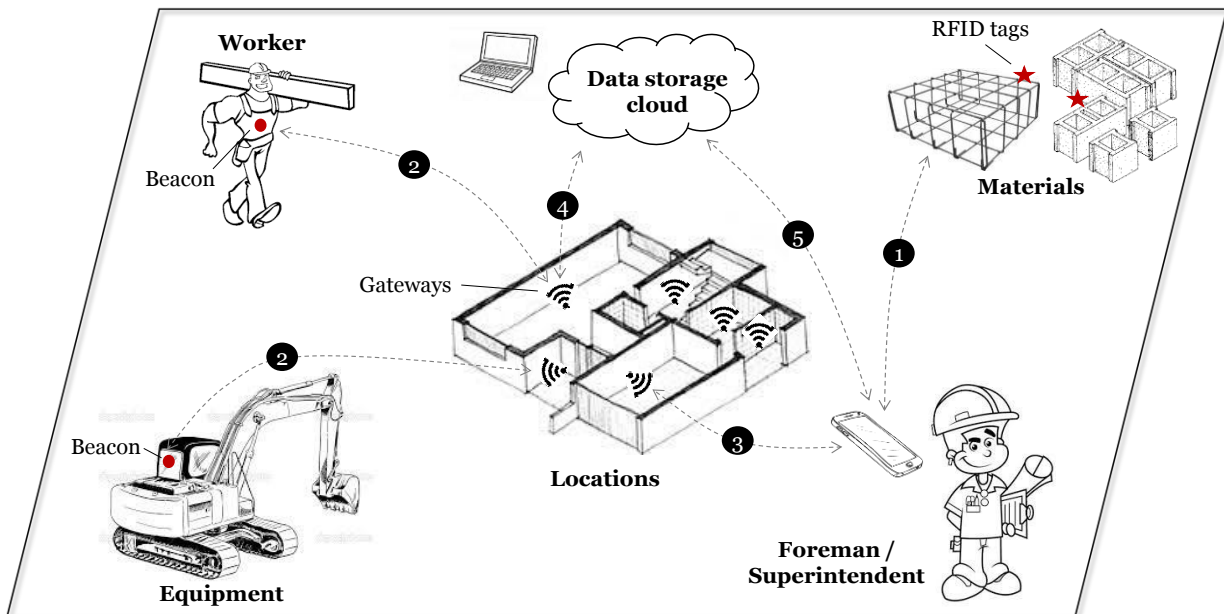


Figure 1: iCONS system

- **Safety management:** Existing solutions have not been integrating locations, equipment and workers. The integrated use of beacons and gateways, combined with BIM simulations, may facilitate the identification of hazardous areas and the use of alarms when necessary.
- **Process information, productivity and waste:** Traditionally, it has been very difficult to know what the workers have been working on and in which locations they have spent time. With iCONS, real-time control may be provided through the integration of location, workers and the app, via data storage cloud, where the project team would receive online information about productivity, comparing the status of each location to the schedule.
- **Material logistics:** Through the integration of materials status with locations, internal and external logistics process may be facilitated, and delivery locations can be prioritized in accordance with the project schedule.
- **Location-based information:** Real-time position sensors and recent systems have been applied for indicating the location of resources relatively accurately. However, this real-time information is not integrated with labour productivity in locations. Thus, real-time and accurate information could improve production control, helping on rescheduling process and defining control actions.
- The great novelty of the iCONS system is not related to the proposed individual links because each has been previously explored individually, but the interactions among them in a common platform, connected through a data storage cloud and an app, providing real-time information to the project team.

5 CONCLUSIONS

The iCONS system proposes the integration of several technological solutions to form a lean production control system supporting LPS, LBMS or TTP, providing real-time information to the project teams and potentially improving the production control process. Project teams can use this system to improve production efficiency, management of suppliers, and safety conditions. The iCONS system is under development and its benefits will be validated in future research.

