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Radio Frequency Identification in Construction Operation and Maintenance—Contextual Analysis of User Needs

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Abstract: Radio Frequency Identification (RFID) denotes any identification system in which electronic devices occur that use radio waves or pulsating magnetic fields to communicate with identification units fastened to objects. In 1995 Jaselskis stated that automatic identification of objects using RFID was a promising technology for the construction industry. However, 13 years later the applications of RFID in the construction industry are rare and mostly occur in prototype projects or when used for theft prevention and access control. From the "Review of current state of RFID technology, its use and potential future use in construction" (Erabuild, 2006) it can be identified that operation and maintenance applications could hold the trigger needed to launch RFID more widely in the construction sector. Therefore the purpose of the research presented in this paper is to identify the actual user needs for automatic identification in construction operation and maintenance.

The method Contextual Design has been used for the identification of the user needs. It is a method developed by Beyer and Holtzblatt (1998) to handle the collection and understanding of data from field studies to be used in the design of software based products. The method is user centered and consists of 7 parts: contextual analysis (inquiry), work modelling, consolidation, work redesign, storyboarding, user environment design and mockup and user test. The method stands out by being well organised and provides a framework of tools to formalise the unstructured connections in work processes through the needs in relation to software development.

In this paper results from the contextual design process are presented and supplemented with practical experiences from implementing a prototype of an RFID-supported operation and maintenance system. It is developed as an extension of the existing mobile edition of the operation and maintenance system SMART from Ramboll Denmark. The conclusions are: 1) A number of needs are identified such as a need for easier on-site information access, increased focus on documentation, education of users, and re-use of knowledge across organisations by new services. The needs can form a basis for more detailed requirement specifications. 2) The introduction of RFID in operation and maintenance may introduce many potential cultural conflicts about e.g. distribution of cost, unwanted surveillance, and public attitude which can influence the success of a wider use of this technology. 3) Requirement from the property owners is needed to gain the benefits from implementing the technology. 4) The technology works in practice. The obstacles for using RFID in O&M is found in information structuring, need for de-facto RFID technology standards in construction and lack in the use of general ontologies for storing and accessing the information resources.

Key words: radio frequency identification, operation and maintenance, contextual design, user needs, mobile IT, system development, pilot test.