Scenarios for applying RFID technology in construction project management

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Radio Frequency Identification (RFID) technology has been widely applied in various areas such as retail, electronic transaction, logistic and supply chain management, scientific research, security, etc. It has brought about great benefits in these areas through improving real-time information visibility and traceability. However, a widespread application of RFID in the construction industry has not taken place. One possible reason is that construction practitioners may have not been fully informed of its potentials. This paper aims to investigate various scenarios that can illustrate the uses of RFID technology in construction project management. The research starts from a brief summary of recent developments of RFID technology in different industrial sectors including construction. 16 researchers were split into 3 groups to investigate how RFID can be used in the management of materials, men, and machinery (M3) for construction projects. Perspectives for future studies are proposed in order to fully realise the potentials. The research encourages a wider adoption of RFID technology in improving current PM practices. It also provides academia with a platform for further exploring the innovative uses of RFID technology in construction.

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1. Introduction

Increasing demands for speed and efficiency in the face of greater complexity of modern construction projects have given rise to the need for management [1]. Today, there are higher standards for successful construction project management (CPM); traditional success criteria for CPM have been broadened from cost, quality, and time (known as PM triangle) to include safety and environment [2]. This requires project managers to make better decision to align materials, labour, and machinery based on the information available. Information is recognised as a new element for CPM success; some even proposed the paradigm that doing construction business is essentially making a web of informed decision across its process based on the information and knowledge available [3]. How to effectively manage information presents new challenges for contemporary CPM.

Among the many challenges for managing information in CPM, a particularly keen one is to improve real-time information visibility and traceability. Project managers need to acquire real-time information about materials, men, and machinery so as to make prompt and informed decisions. This echoes with Flanagan and Lu [3] who suggested that the main objective of information management is to make sure that accurate information is always available at the right time in the right format to the right person to support decision making. Here the information could include inventory of materials, positions of construction workers, conditions of machinery, and so on.

The increasing complexity of modern construction projects, together with some innovative CPM models such as Just-In-Time (JIT), lean construction, prefabrication, all desires new approaches to provide real-time information with better visibility and traceability.

Notably, in industrial sectors such as logistic and supply chain management (LSCM), manufacturing, RFID technology has been widely discussed. In LSCM scenarios, for example, using RFID technology, such real-time traceability and visibility, enabled at the upstream, are important for increasing the efficiency and quality of supply chain operations, especially towards the downstream (e.g. distribution, wholesale, and retail) [4–8]. In the manufacturing sector, Huang et al. [9–11] investigated the RFID-based wireless manufacturing jobsites with better real-time information traceability and visibility. However, little attention has been paid to the investigation of RFID technology in construction which is also viewed as an information-based industry in addition to its labour, material, and capital intensive nature [31]. In comparison with the heated debates in other sectors, a widespread adoption of the technology has not been seen in real-life construction practices.

The primary aim of this research is to explore the potential applications of RFID technology in CPM. The rest of the paper comprises of five sections. In Section 2, recent developments of RFID technology in different industrial sectors including construction are reviewed. Research methods are presented in Section 3. Using a narrative form, Section 4 describes the various scenario cases that illustrate the potential applications of RFID in CPM. These scenarios have been further animated by using Google Sketch Up in our