Chapter 18

Emerging Mobile Service Applications: The Case for RFID in Healthcare

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ABSTRACT
This chapter discusses the adoption of Radio Frequency Identification (RFID) technologies as an emerging phenomenon enabling innovative mobile service applications. More specifically, it focuses on the healthcare sector by examining how RFID-enabled Real Time Location Systems (RTLS) can be used to enhance patient care processes while reducing costs of operations. Since different technological designs can be elaborated for a single application, there is a need for practitioners to have a better understanding of the technological options available on the market. Although much information is already available in the literature, many of it is not vendor neutral, resulting in more confusion for practitioners. This chapter addresses this gap by identifying specific comparison variables and using them to highlight the key differences between various RFID-enabled RTLS systems.

INTRODUCTION

An infusion pump self-identifying its location and its status, a wheel chair warning you that someone is stealing it, a patient status updated in real-time without any human intervention, a medication warning of its incompatibility with a patient, an empty shelf of medical supplies automatically asking for replenishment, (...) all these applications are now possible using RFID technologies. The healthcare sector around the globe faces an increased demand to cut down costs, streamline operational efficiencies and comply with government regulations while improving the quality of care services. The combined effect of scarce and limited competent resources, inefficient systems and an aging population result in a significantly increased demand for healthcare services. For instance, in its last budget speech delivered at the National Assembly, Québeq’s Minister of Finance declared that “the [province’s] healthcare system’s expenses rose from 31% of total program...
expenses in 1980 to 45% in 2010. At that rate, the province’s healthcare budget will account for two thirds of program expenses in 2030” (Bachand, 2010). Although this quote is taken from a local Canadian context, it represents a global trend for healthcare services where the health system’s share of program expenses is constantly rising. For instance, in the US, national health expenses projections were expected to reach $2.5 trillion in 2009 and $4.5 trillion by 2019 (US.HHS, 2009). This trend in expense increases is worsened by an increasing shortage of doctors, nurses and skilled ancillary personnel, undue work pressures, ineffective communication mechanisms and already existing but unreadily available clinical information (Crounse et al., 2006; Agarwal et al., 2008).

Indeed, in order to address these challenges, hospitals around the globe are increasing their adoption of:

- Enterprise information systems such as vertical Enterprise Resource Planning (ERP) solutions,
- Advanced mobile technologies such as portable computers and smart-phones,
- Wireless data networks such as Wi-Fi networks
- And automation technologies such as bar-codes, and more recently Radio Frequency Identification (RFID) technologies which use radio waves to automatically identify and track any (mobile) objects in real time, without human intervention.

This paper discusses the adoption of RFID technologies as an emerging phenomenon enabling innovative mobile service applications in the healthcare sector by examining how the technology can be used to enhance patient care processes while reducing costs of operations. In particular, the paper will look at active RFID technologies enabling Real Time Location Systems (RTLS) adopted by a growing number of hospitals for asset tracking, patient monitoring and other applications where knowledge of the real-time location and status of mobile objects are important.

Despite the fact that RFID technologies seem to offer a unique potential to manage mobile assets and improve patient workflow over existing Automatic Identification and Data Capture (AIDC) technologies, some questions remain since there is no clear benchmark analysis on the technological options available on the market. For instance, while some vendors recommend RFID-enabled RTLS systems that leverage on the hospital’s existing Wi-Fi infrastructure, others suggest the use of active Ultra Wide Band (UWB), ZigBee-Mesh Network, Infra-Red (IR), proprietary 433 MHz technology, or Ultra Sound Identification (USID) technologies. Although some information is already available in the professional literature (e.g. O’Connor, 2009), many of what is published is in the form of white papers proposed by vendors, resulting in some confusion for potential adopters facing contradictory information.

Since different technological designs can be envisioned for a single application there is a need for practitioners to develop a better understanding of the technological options available on the market and determine which RTLS technologies are best suited for their needs. In order to address this gap, the main objective of the paper is therefore to propose a benchmarking framework in order to help managers for rapidly assessing the performance of RFID-enabled systems against their specific application requirements.

The paper is organized as follows. The next section presents an RFID system in terms of technological layers and how it should be integrated with hospitals’ backend systems to support efficient processes. In section 3, RFID applications in healthcare are discussed, with an emphasis on RTLS solutions enabling innovative mobile service applications designed to enhance patient care processes while reducing costs of operations. Since RTLS solutions can be based on various technological designs, in section 4 we will present a benchmarking framework using comparison
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