Radio Frequency Identification Technologies and Issues in Healthcare

Amber A. Smith-Ditizio
Texas Woman's University, USA

Alan D. Smith
Robert Morris University, USA

INTRODUCTION

Barcoding and RFID-Related Technologies in the Services Sector

Barcodes and related identification technologies have been used to control inventory and supply chain management (SCM) for some time, especially in retail and purchasing applications (Aldaihani & Darwish, 2013; Azadeh, Gholizadeh, & Jeihoonian, 2013; Bhamu, Khandelwal, & Sangwan, 2013). Barcoding equipment is fairly inexpensive and easy to use as compared to other AIDC technologies (Smith, 2011; Smith, Smith, & Baker, 2011; Smith & Rupp, 2013; Visich, Li, Khumawala, & Reyes, (2009; Wilson, 1995; Wyld, (2006). However, certain limitations create the need for a new approach to increase efficiency (Drejer & Riis, 2000; Dutta, Lee, & Whang, 2007; Fisher & Monahan, 2008; Fumi, Scarabotti, & Schiraldi, 2013). Barcodes are only accurate if items are continuously scanned in and out as they move along the supply system. An employee must ensure an item is scanned at each stage, or entry and exit point. An example of this would be a delivery driver that scans packages as a truck is loaded and scans the package at the delivery point. If the package is not scanned, the action is not accurately recorded. Barcodes require an employee to physically inspect the item for scanning purposes to ensure inventory accuracy and determine the product's location, while Radio Frequency Identification (RFID) conveniently tracks products through radio waves, designed to improve operational efficiency.

RFID technologies helped Walmart to control its inventory and track product movements along its supply chain (Tarofdor, Marthandan, Mohan & Tarofdor, 2013). Furthermore, RFID has been used in the identification of stray pets, which is known as chipping and in transportation, in addition to sports. Experimentation with RFID in soccer may soon allow a visually impaired player to participate in the game by integration of computers and video cameras, along with an active RFID tag to signal to the player through a set of audio headphones (Zare, McMullen & McCune, 2014).

DISCUSSION

RFID in the Healthcare Industry

Anand and Wambaa (2013) performed a case study to evaluate how RFID can be applied in healthcare settings. The authors suggested that there are significant benefits for both patients and healthcare organizations in the application of such technology. Adoption in the healthcare industry is not widely spread because of the initial high cost associated with equipment and technology implementation. One argument against the investment emphasizes that the technology primarily focuses on tracking and implies that the costs outweigh the benefits (i.e., compared to the cheaper alternative of barcodes). However, Anand

et al. compared the evidence collected from 39 hospitals and analyzed the costs and benefits of RFID implementation over the long run. Their findings indicated that RFID-embedded systems can save time and reduce waste.

Hence, RFID-related technologies can help reduce costs associated with the medical supply chain (e.g., pharmaceuticals and medical supplies) or in patient tracking and management. For example, high-valued supplies, such as blood can be equipped with RFID tags that can ensure that the right type of blood is being administered to the right patient (Winters, 2010). When associated with patient tracking, RFID can be used to track patient history as well as hospital admittance, transfer, and discharge. Advantages also include reducing redundant work and time consuming processes by making certain that the correct blood is drawn from storage. This allows healthcare providers to concentrate on patient care and service (Dominic, Goh, Wong, & Chen, 2010; Tarofdor, et al., 2013). RFID-related technologies can also reduce errors and waste by assuring that the accurate drug or medical product, ordered from the appropriate supplier is used at the proper time for the correct patient in the suitable dose.

RFID is an acceptable way to automate and improve the tracking of medical products and pharmaceuticals. Patients gain from RFID-related technology because of the reduction in errors when healthcare providers are prescribing or fitting medical products to them. As suggested by a number of researchers (Smith, 2012, 2013a, 2013b, 2013c; Ting, Kwok, Tsang, & Lee, 2009; van der Togt, Jan van Lieshout, Hensbroek, Beinat, Binnekade, & Bakker, 2008; Wickboldt & Piramuthu; Zang, & Fan, 2007), the experimentation of RFID in a variety of fields [i.e., sports, SCM, operations management, lean manufacturing] may lead to new discoveries and other applications (Hu, Wang, Fetch, & Bidanda, 2008; Ifinedo & Nahar, 2009; Jain, Benyoucef, & Deshmukh, 2008; Johansson & Sudzina, 2008; Jones, Riley, Franca, & Reigle, 2007; Ketikidis, Hayes, Lazuras, Gunasekaran, & Koh, 2013; Koong & Lin, (2007).

The application of RFID technology on the soccer field, for example, may also be applied to patients in the emergency room setting or soldiers on the battlefield; the range of active RFID tag can easily reach 300ft. and can detect direction and motion (Zare, et al., 2014). Emergency room specialists can analyze the information from RFID to track patient movements.

Implications for Medical Supply Chain Management

RFID utilizes radio waves to communicate, track, and trace products along the supply chain with the goal of helping to boost efficiency through enhanced data communication, counterfeit reduction, and drug quality insurance. There are many studies that point to the obvious operational efficiencies and reduction in waste and errors associated with the implementation of RFID-embedded systems (Aldaihani & Darwish, 2013; Azadeh, et al., 2013; Bhamu, Khandelwal, & Sangwan, 2013; Chen, Wu, Su, & Yang, 2008). For example, one main cost for any firm is a lack of knowledge of supply chain integration and how to manage a company's inventory, especially in promoting vendor-managed inventory system and the use of virtual asset trackers (VAT). A company does not want to order as many products as they can and expect it to empty its shelves instantly. By using certain IS applications [automatic identification and capture systems (AIDC) like barcodes, smart cards, touch memory, RFID] aligned with supplier practices, a company can have an improved supply chain performance well into the future ("Healthcare IT outsourcing …," 2016).

Qrunfleh, Tarafdar, & Ragu-Nathan (2012) provided an empirical based study of how the alignment between supplier management practices and information systems strategy provides a positive association with supply chain integration goals. From their research, as illustrated in Figure 1, IS for efficiency refers to a strategy that is oriented toward operational support of intra- and inter-organizational efficiencies and that the

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