Chapter 8.7
Facing the Challenges of RFID Data Management

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ABSTRACT

Radio frequency identification (RFID) has generated vast amounts of interest in the supply chain, logistics, and the manufacturing area. RFID can be used to significantly improve the efficiency of business processes by providing automatic data identification and capture. Enormous data would be collected as items leave a trail of data while moving through different locations. Some important challenges such as false read, data overload, real-time acquisition of data, data security, and privacy must be dealt with. Good quality data is needed because business decisions depend on these data. Other important issues are that business processes must change drastically as a result of implementing RFID, and data must be shared between suppliers and retailers. The main objective of this article is focused on data management challenges of RFID, and it provides potential solutions for each identified risk.

INTRODUCTION

According to the definition provided by the *RFID Journal,* "Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity of an object or person wirelessly in the form of a unique serial number, using radio waves. It's grouped under the broad category of automatic identification technologies." RFID is much more advantageous than the barcode and other smart card technologies. When a large quantity of items are moved from one place to another place, the individual reading and processing of tags is time consuming when using barcode. RFID can deal with those items with the design and mapping of generic IDs of

individual products. In Malaysia the government's commitment to drive the use of RFID has led to the successful adoption of chip-based credit cards. The Veterinary Services Department of Malaysia has decided to tag all 2.5 million livestock animals with economic value such as cattle, goat, and pigs by 2008 (Businessweek, 2007). It is expected that the RFID technology will grow very fast over the next three years. The global RFID market, which would include services, software, readers, and tags, will grow from $2.8 billion in 2006 to $8.1 billion by 2010 (The Economist, 2007).

RFID has a wide range of applications including warehouse resources management system (Chow, Choy, Lee, & Lau, 2006), integrated inventory management system (Saygin, 2007), retail management system (Sellitto, Burgess, & Hawking, 2007), real-time food traceability system (Connolly, 2007; Folinas, 2006; Kelepouris, 2007; Regattieri, Gamberi, & Manzini, 2007; Kempfer, 2007), product lifecycle management system (Harrison, McFarlane, Parlikad, & Wong, 2005; Parlikad & McFarlane, 2007), health care environment management system (Janz, Pitts, & Otondo, 2005), library resources management system (Yu, 2007), and shop-floor automation and factory information system (Qiu, 2007). Popular retailers like Wal-Mart, Gillette, Marks & Spencer, Tesco, Target, and Home Depot have already adopted the RFID technology. Using RFID data, Wal-Mart can predict the sales of a given item on a store-by-store basis and find out the reason why some products did not sell well. RFID allows Wal-Mart to sit down with its partners and plan how best to move products (Roberti, 2004). Gillette investigated the manner in which its tagged products were delivered from factory to customer store in its packaging and distribution center. Benefits reported by these stores appear to be directly related to the availability of the RFID data that are more accurate and timely than what was previously available, thereby allowing stock inventory to be better managed (Roberti, 2005a).

RFID data that is collected during the manufacturing process includes process start and finish time, product location, equipment location, labor location, equipment working status, stock keeping units (SKU), staff members' identities, and quantity of goods received. In retail industry, date of manufacture, product ingredients, temperature history, number of operation cycles, total time in operation, and details of maintenance would be recorded. Apart from the manufacturing and retail industry, RFID also plays an important role in the health care industry. Verichip is marketing its human-implantable RFID chip for medical use. The chip, which is the size of a grain of rice, can be injected into a person's arm. The pertinent medical records can be saved in the chip with a 16-digit code. Verichip expected the sales resulting from RFID chips to increase from $27.3 million in 2006 to $36 million in 2008 (Marcial, 2007).

Venture Development Corp. surveyed 100 chief technology officers and found that data management and monitoring was rated as one of the most important issues in the implementation of RFID systems (Li, Visich, Khumawala, & Zhang, 2006; O'Connor, 2004). Conventional systems, such as bar code printers and readers, are designed for human processing and are restricted to low transaction volumes. On the contrary, RFID can automate these processes and has the potential to generate much more data. RFID increases the volume of data substantially, as items leave a trail of data while moving through different locations. It is known that Wal-Mart's in-store RFID implementation will generate about 7.5 terabytes of RFID data a day. This overwhelming amount of data calls for newer and efficient data management approaches (Kasturi, 2005).

The reliability, quality, and management of the data must be sufficient because business decisions are made with these data. RFID technology entails risks with regard to data management, which can have an important influence on the result of implementing the technology. Another important issue is that business processes must change drastically

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