RFID Technologies and Warehouse Applications:
Case Studies

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INTRODUCTION

Chapter Overview of RFID Technologies and its Applications

Although radio frequency identification (RFID) technologies have been around for some time, the use of the technology in supply chain management (SCM) and its associated operations is still being explored and yet to be fully implemented/adopted by many companies. Basically, RFID uses electromagnetic fields to help with identifying and tracking objects. The number of ways that the technology can be used is almost endless as many examples can be found in preventing theft, expediting inspections, keeping track of surgical sponges, safeguarding pharmaceuticals, helping farmers with vital crop and social moisture information, to name a few (Hamidi, Farahmand, Sajjadi, & Nygard, 2012; Kumar, Shankar, & Yadav, 2011; Mathirajan, Manoj, & Ramachandran, 2011; More & Babu, 2012). RFID technology used in warehouses for receiving product, picking orders, packaging shipments, and tracking deliveries can save a company time and money and is part of an array of available Automatic identification and data capture technologies (AIDC), including the universally accepted barcodes. For growing companies such as the University of Pittsburgh Medical Center (UPMC) and Boeing, the introduction can help them remain efficient during these times of prosperity and growth.

BACKGROUND

Overview of RFID Technology

RFID is defined any method of identifying unique items using radio waves. This is usually done when a reader (or an interrogator) communicates with a transponder (Smith, 2017a, 2017b, 2017c). This transfer of information happens without the devices making any actual physical contact and is used in items we use every day like car keys, employee identification cards, medical history, highway toll tags, and security access cards. In essence, RFID is a modern and impactful technology that is changing the way a logistics operates. As this research paper has shared in earlier sections, the technology surrounding RFID technology has existed since the earlier 1900's and has more recently been implemented to support the transportation industry due to technology and cost improvements. Formally, according to the RFID journal is "any method of identifying unique items using radio waves such as through a reader which communicates with a transponder and holds digital information in a microchip. There are chipless forms of RFID tags that use material to reflect back a portion of the radio waves beamed at them (Radio

Frequency Identification).” RFID has been a way of continuing to evolve in many practices specifically as it relates to SCM. Historically, as this course has demonstrated, SCM productivity evolved from the human based way of tracking and transporting inventory for companies to more automated systems such as bar codes and RFID technology. RFID systems are important components in the Toyota Production System (TPS) in effective manufacturing and SCM.

Probably, the first venture began with bar code technology as a way of tracking and transmitting information. The optical nature of barcode requires labels to be within the proper line-of-sight between label and reader, which is often difficult, if not impractical, to achieve in industrial environments. A barcode reader must have typically clean, clear optics, the label must be clean and free of abrasion, and the reader and label must be properly oriented with respect to each other” (“Advantages of RFID,” 2018, p. 1). RFID-enabled technology helps to solve many of the issues and challenges caused by direct line of sight technology by allowing information to be transmitted through a receiving device. Improvements in such technology have allowed tag reading from greater distances and in harsh environments. RFID technology is the next wave, arguably the current and sustainable wave in industrial applications, of being able to efficiently track and transmit information in order to provide greater efficiency improvements to logistics and SCM systems (Zelbst, Green, Sower, & Reyes, 2012).

Low-frequency systems were developed first then products moved up the radio spectrum to high frequency which means there is a greater range and data can be transferred at much higher rates (Roberti, 2005). High-frequency systems are used to track cargo containers, payment systems, and contactless smart cards. In the 1990s, IBM developed ultra-high frequency (UHF) RFID systems which offered even greater ranges and faster data transfers. They originally worked with Wal-Mart in their development and then in warehouses and farming. UHF RFID technology was taken to the next level in 1999 when the Uniform Code Council, EAN International, Procter & Gamble, and Gillette funded the establishment of the Auto-ID Center at MIT. They developed a low-cost RFID tag to put onto all products to track them through the supply chain and then linked this information to the Internet (Roberti, 2005). This was the first time that information contained in an RFID tag was available beyond the tag and reader themselves. The Auto-ID Center received support from over 100 large companies between 1999 and 2003 including the Department of Defense. It then opened up facilities in Australia, the United Kingdom, Switzerland, Japan, and China. Protocols, a numbering system called Electronic Product Code (EPC), and a network were developed and in 2003 the technology was licensed to the Uniform Code Council.

Currently, many companies are trying to develop smaller and smaller tags, some containing just 2 components (Landt, 2005). This means that RFID tags can now be found even in paper-like labels which can be affixed to almost anything. Advancements in RFID technology continues to grow at faster rates and the applications for use continue to grow as well.

Implications for Technology-based Supplier Integrations

A lack of universal application and its fully implementation of RFID-based technologies is very typically that in the absence of proactive management, the companies under consideration would find itself under this situation to not see the vision of implementation of such technologies to suppler integrations (Basu & Nair, 2012; Paksoy & Cavlak, 2011; Pettersson & Segerstedt, 2011; Pradhananga, Hanaoka, & Sattayaprasert, (2011; Von Haartman, 2012). With the current climate with top management in many companies regarding any change is “if it is not broken do not fix it” and “how much is it going to cost us?” no wonder they find themselves in this predicament. It is a wonder they even perceive that there is a problem. Perhaps, one of the first steps is to see if the firm’s management really want to have a formal

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