The Role of Technology Standardization in RFID Adoption: The Pharmaceutical Context

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ABSTRACT

In the United States (U.S.) retail industry, endorsement from an industry key figure spurred the adoption of radio frequency identification (RFID), but this did not turn out to be the case within the pharmaceutical industry. In order to provide insight into adoption drivers that are specific to the pharmaceutical industry, this research develops a theoretical model of RFID adoption factors, in which: (i) technology standardization is the main driver; (ii) three aspects of RFID technology that need to be standardized are specified; (iii) special attention is given to the adoption behavior of late adopters, rather than the existing early adopters; and (iv) a specific context for the pharmaceutical industry is provided by taking into account the key industry characteristics. The model provides practical insight for dealing with some of the adoption challenges faced by the U.S. pharmaceutical industry.

Keywords: Critical Mass, Network Externality, Pharmaceutical Industry, Radio Frequency Identification (RFID), Technology Adoption, Technology Standardization

INTRODUCTION

Radio frequency identification (RFID) is a wireless technology that is capable of identifying individual items and automatically capturing their data. In contrast to bar codes, RFID does not require the product positioning for scanning, and as a result, it can scan multiple tags simultaneously without undoing the packaging (Kabachinski, 2005; Zebra Technologies, 2004). RFID tags are also more robust and durable, and they can store more information than bar codes can, thereby possessing a capability to generate item-level supply chain data that have not been obtainable by the use of bar codes. Hence, RFID promises many benefits over the bar code technology in the context of supply chain management, including efficient handling of materials, increased product availability, improved asset management, and achieving supply chain visibility (e.g., Angeles, 2005; Li & Visich, 2006; Taghaboni-Dutta & Velthouse, 2006). For the pharmaceutical supply chain in particular, RFID has the potential to significantly reduce counterfeiting, to improve product recall management, and to prevent prescription
and administering errors (Matalka, Visich, & Li, 2009; Wicks, Visich, & Li, 2006; Wyld & Jones, 2007).

Wal-Mart’s 2003 supplier mandate on the use of RFID for tracking supplies had a significant impact on initiating RFID adoption in the retail supply chain in the United States (U.S.). In the U.S. pharmaceutical industry, the push for RFID began with a 2004 report called “Combating Counterfeit Drugs,” which was issued by the Food and Drug Administration (FDA), the primary regulator of the industry. The report conveyed the FDA’s strong endorsement for RFID as the track-and-trace technology that would enable an industry-wide use of pedigrees — records of chain of custody for each drug — in securing the national drug supply chain. It was originally considered feasible to accomplish widespread implementation of RFID by 2007, a time frame that would correspond to the use of pedigrees becoming a legal requirement under the Prescription Drug Marketing Act (PDMA) (FDA, 2004). By 2006, however, the FDA acknowledged that widespread adoption of RFID was not realistic in the near future (FDA, 2006).

Endorsement from an industry key figure, Wal-Mart, spurred RFID adoption in the retail supply chain, but support from the FDA, which was an authority figure in the pharmaceutical industry, did not have the same effect. What, then, would drive the significant increase in RFID adoption in the pharmaceutical supply chain? The main adoption driver seems to be different from that observed in the retail industry.

Some industries have tried to promote the spread of RFID adoption through technology standardization. For example, in 2008, the financial industry initiated the development of industry-wide process standards in order to facilitate the use of RFID for document tracking and Information Technology (IT) asset management (RFID Update, 2008b). Also in 2008, the oil and gas industries, which were interested in improving internal and supply chain processes, formed the Oil & Gas RFID Solution Group to identify best practices for using RFID and to develop data standards for supporting those best practices (RFID Update, 2008c). In 2009, DASH7 Alliance, which consisted of more than 20 RFID vendors, users, and researchers, promoted the wider use of RFID technology in the commercial sector by supporting the ISO 18000-7 standard, which was the RFID standard used in the defense industry (RFID Update, 2009).

In general, the existing literature on technology adoption shows that a lack of standards serves to inhibit the adoption of new technologies. For example, Suzuki and Williams (1998) showed that a lack of industry-wide format standards was positively related to resistance to the adoption of Electronic Data Interchange (EDI) technology. In the cases of VCR, DVD, and 56K modems, all experienced the existence of two competing standards at the onset, and this lack of unified standards initially inhibited the spread of these technologies (Augereau, Greenstein, & Rysman, 2006; Dranove & Gandal, 2003; Park, 2004).

In the case of RFID, four studies discussed the relationship between technology standardization and RFID adoption. First, Shih, Chiu, Chang, and Yen (2008) identified that a lack of RFID standards was one of the significant barriers for RFID adoption among Taiwanese companies, most of which were free of customer mandates like the ones issued by Wal-Mart in the U.S. Second, Whitaker, Mithas, and Krishnan (2007) provided empirical evidence that a lack of information-sharing standards was positively related to firms’ expectations of a delayed return on RFID investment. Based on this result, Whitaker et al. (2007) speculated that the emergence of standards would spur RFID adoption by allowing an earlier return on RFID investment. Third, Cannon, Reyes, Frazier, and Prater (2008) postulated that the emergence of RFID standards, among other things, would help to spur RFID adoption by reducing the long-term uncertainty associated with the technology. Lastly, Gerst, Jakobs, and Bunduchi (2009) studied the standardization landscape in the RFID market and concluded that the fragmented landscape due to the non-unified stakeholders was one of the major obstacles for the wide adoption of RFID.