

# Chapter 5

## A Conceptual Framework of RFID Adoption in Retail Using TOE Framework

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### ABSTRACT

*Motivated by the need to understand the underlying antecedents of RFID adoption in retail, this study proposes and tests a framework predicting RFID adoption intent. Based on the TOE (technology-organization-environment) framework, this research develops and validates the research framework to examine the influence of twelve contextual factors under four broad categories (technological, organizational, environmental, and value-chain) on RFID adoption in retail. A structured study instrument is developed to measure these variables and data are collected from 74 experts spread across different business associations through Delphi technique. Multivariate discriminant analysis (MDA) is used to develop the conceptual framework for RFID adoption. The results indicate that relative advantage, competitive pressure, catalyst agent, and value chain complexity are significant determinants of RFID adoption in retail. It suggests that environmental characteristics are very important to be considered in RFID adoption studies along with technological and value chain characteristics.*

### 1. INTRODUCTION

Despite extensive research on adoption and diffusion of innovation, adoption of emerging technologies with specific characteristics is still not well understood (Rogers, 1995). Adoption of electronic data interchange (EDI) is an example where generalizations of diffusion theory could not be directly applied and new models were developed to understand the adoption patterns by identifying adoption drivers (Chwelos et al., 2001; Sharma et al., 2008). There are many studies on technology adoption in the field of information systems (IS) at both individual and organizational level (Abu-Shanab & Ghaleb, 2012;

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Alshesri et al., 2013). In this study the focus is organizational adoption of technology. The unique characteristics offered by Radio Frequency Identification Technology (RFID) distinguishes it from other technologies such as internet and EDI and warrants further investigation specifically around its adoption. RFID is a wireless automatic identification and data capture (AIDC) technology (Ross et al., 2009) used to track and trace pallets and cases.

RFID caught the attention of the media when giant retailers like Wal-Mart, Tesco, Target, and Albertsons announced that they were going to adopt RFID to streamline supply chain operations and demanded that their suppliers become RFID compliant. According to Das (2006), the retail sector is expected to comprise 44% of the global RFID market value for systems including tags by the year 2016. On the other hand, according to a survey sponsored by NCR (NPN, 2006) only 9% of participating retailers have an RFID implementation timeline as compared to 44% of participating manufacturers. About 60 percent of the retailers in this group are large retailers with more than \$5 billion in annual revenues and they reported an increase in their spending as RFID technology is being introduced across different product lines. However, only 29 percent of the retailers expect to have a RFID-enabled pilot store opened by the end of 2006 (Kilcourse, 2008). This strongly indicates that the retail sector is not adopting RFID technology as rapidly as expected.

While the emerging literature of RFID adoption and use has demonstrated the high operational and strategic value of this technology (Ngai et al., 2014), the implementation challenges, including infrastructure costs, environmental upheaval, top management leadership, second-order organizational learning, resource commitment, and organizational transformation have caused many potential adopters to back away from RFID. Most of the suppliers struggled to adopt and use RFID technology cost-effectively for competitive advantage (Ross et al., 2009). In addition, prior studies on RFID adoption have stressed the importance of adoption mandates particularly in the early stages of exploring the potential of the technology. The importance of these mandates diminishes over time as the perceived benefits and risks related to the technology are assessed (Wamba, 2012).

Thus the actual fact is that the adoption of RFID technology has been slower than predicted, mainly because the hype associated with any emerging information technology (IT) (Bendavid et al., 2013) gave researchers and practitioners unrealistic expectations. In reality, the widespread adoption of any given technological innovation is facilitated by changes in the “business perceptions of the business value—that are held by adopters and non-adopters” (Keating et al., 2010). Therefore, it is critical to deepen our understanding of the various factors determining the adoption of RFID technology by firms.

Many of the studies of organizational adoption of technology have drawn from the work of Tornatzky and Fleishcher's TOE (technology-organization-environment) framework (Tornatzky & Fleischer, 1990; Chwelos et al., 2001; Teo et al., 2004) who grouped factors influencing organizational adoption into technological, organizational, and environmental contexts. Technological context refers to innovation characteristics. The organizational context describes the organization and its characteristics, and the environmental context refers to the surrounding in which an organization conducts its business. It encompasses the industry and dealings with business partners, competitors, and government. Prior RFID adoption studies have not always investigated the three contexts in a comprehensive manner. Most of these have focused on a few factors instead (Brown & Russell, 2007). Additionally, most of the previous studies show the importance of technological factors; however the effects of organizational and environmental factors have been varied across different industrial contexts (Wang et al., 2010). Thus there is still more need to analyze the drivers of RFID adoption in different industrial contexts for a better understanding.

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