Chapter 34
Green Characteristics of RFID Technologies:
An Exploration in the UK Logistics Sector from Innovation Diffusion Perspective

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ABSTRACT

Logistics is an integral part of the supply chain. Many logistics service providers have acknowledged that if they want to operate more efficiently and responsively, they must adopt technologies that help manufacturers, warehouses, and retailers to communicate with each other more efficiently. Radio Frequency Identification (RFID) technology has been identified as an important application among many logistics technologies and is increasingly gaining both practitioners' and researchers' attention. The purpose of this chapter is to explore the factors affecting logistics service providers' intentions to use RFID technology, with special emphasis on its environmentally friendly green characteristics. The theoretical perspective diffusion of innovations is used for the purpose. The data is collected using a questionnaire survey among the UK logistics companies. The analysis shows that observability of green characteristics positively influences the intention to use RFID.

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INTRODUCTION

Radio frequency identification (RFID) is one type of auto-identification technology that uses radio frequency (RF) waves to identify, track and locate individual physical items. This technology has been used in many applications including manufacturing and distribution of products (Lin & Ho, 2009a,b). While RFID is useful in improving several functions within a firm, we focus on the logistics function in this study. Applying RFID can help improve logistics in several ways. Lin (2009) points out that the capabilities of RFID to closely monitor and track positions of vehicles can assist companies to successfully manage their warehouses and supply chains. Additionally, cost savings, supply chain visibility, and new process creation have been identified as three key benefits of RFID adoption (Roh et al., 2009). Wamba (2012) claims that RFID can be useful in integrating supply chains by improving shipping and receiving processes, automatically trigger specific processes, foster higher level of information sharing among supply chain partners and finally promote the use of new business processes.

In worldwide academic research on RFID technology, the majority of papers have focused either on the general overview of RFID, or the applications of RFID in various industries, such as in fashion (Luyskens & Loebbecke, 2007; Moon & Ngai, 2008), service (Lee, et al., 2008), retail (Jones, et al., 2005), manufacturing (Wang et al., 2010), electronics (Muller-Seitz et al., 2009), library (Rong, 2004), and automotive industry (Schmitt, et al., 2007). However to date, there has been a limited amount of published knowledge on the discussion of the drivers or influencing factors that lead logistics industry to consider RFID. Further, prior research has not applied Innovation Diffusion Theory to study RFID adoption, especially in the logistics industry. Moreover, none of the previous studies considered green characteristics of RFID. Given the increasing importance of green issues, there is a need to understand how the perceived positive green characteristics are affecting the level of adoption of the RFID technology.

The aim of this paper is therefore to explore the factors affecting logistics service providers' intention to use RFID, with special emphasis on its environmental friendly green characteristics. We draw upon the theory of diffusion of innovations (Rogers, 1995) to develop a conceptual model of factors influencing RFID adoption. This theory suggests five attributes influence technology adoption: relative advantage, compatibility, complexity, trialability, and observability. The research question is to explore whether the innovation characteristics of RFID influence its adoption in the UK logistics industry.We have extended the theory in this research by including a new attribute that is increasingly becoming more relevant in the current business environment: environmental friendly (also called green) characteristics of RFID.

The remainder of the paper is structured as follows. In the next section, we provide a literature review on RFID adoption. We then develop our conceptual framework and research hypothesis building on the literature survey and innovation diffusion theory. This leads us to the fourth section of our paper, in which we present our research methodology including analysis methods and measure purification. In Section 5, we present our data analysis.Section 6 discusses our results. Finally, conclusions and future research directions are drawn in the last section.

LITERATURE REVIEW

Background of RFID Technology

An RFID system consists of three primary components: the tag or transponder; the readers; and the middleware. It is always connected to an enterprise application system for data processing in support of