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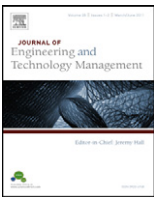

A model of the adoption of radio frequency identification technology: The case of logistics service firms

Wei-Chen Tsai [a,*], Ling-Lang Tang [b]

[a] Department of Information Management, Aletheia University, 32 Chen-Li Street, Tamsui, Taipei, 25103, Taiwan, ROC
[b] College of Management, Yuan Ze University, 135 Yuan-Tung Road, Chung-Li, Taoyuan, Taiwan, ROC

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ABSTRACT

Globalization and advances in information technology represent both realities and opportunities for enterprises in the 21st century. This paper aims to broaden understanding of service innovation as a critical organizational capability through which the adoption of information technology influences firm performance. This study examines how the adoption of radio frequency identification (RFID) technology influences the operational performance of logistics service firms. We develop the RFID adoption model based on the interorganizational information systems (IOS) view of the firm that integrates the various strands of research into the framework. The study draws from the related information technology and inter-organizational information systems literatures to explore organizational factors associated with the adoption of RFID. A model of the associations between information technology and interorganizational information systems use, social support, power structure, organizational readiness, procedural flexibility, and top management support is developed, and hypotheses are advanced about the relationships among these constructs. An empirical survey was conducted among 500 logistics service firms in Taiwan. A total of 131 valid observations were analyzed using the partial least squares technique. Results showed that RFID adoption has positive effects on business practices, which in turn improves operational performance. We address the value of certain interactive firm behaviors in RFID adoption and identify related constructs of RFID adoption in terms of their efficiency and value for logistics service firms. These results have implications for both education and practice.

* Corresponding author. Tel.: +886 2 2621 2121x5533.
E-mail addresses: au5724@mail.au.edu.tw (W.-C. Tsai), balltang@saturn.yzu.edu.tw (L.-L. Tang).

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Introduction

It is very important that logistics firms be able to compete in the delivery service market (Dutta et al., 2007). Logistic management is one of the key success factors of a supply chain system. Reducing costs, and improving efficiency and service quality in a competitive business environment are the main concerns of many logistics service providers. Many logistics companies have invested extensively in information and logistics technologies. Logistics companies could increase their performance by employing RFID (radio frequency identification). RFID is the latest technology being used to gain and sustain such a competitive advantage. Similar to a bar code, RFID is an automated identification and data collection technology that uses radio frequency waves to transfer data between a reader and items to which RFID devices have been affixed (Ranky, 2006). The benefits of RFID are that it accurately recognizes each item; tracks items as they move through the supply chain; shares information with business partners; and allows for collaboration in terms of inventory management, planning, forecasting, and replenishment (Subramani, 2004; Vijayaraman and Barbara, 2006). Moreover, firms use RFID results in reduced labor costs, simplified business processes, and more accurate inventory management, especially for distributors in the logistics industry (Kim et al., 2008).

However, Organizations that have failed RFID implementations have been plastered all over the press because of lack of technology, deficient IT knowledge, budgetary constraints, unqualified business partners and misunderstanding of the overall effectiveness of the technology and how it relates to its business. Therefore, to understand RFID technology, organizations must grasp the concepts of operation and the components of the system.

Service innovations can enhance supply chain performance and increase customer value. The RFID system is a critical innovation technology for improving logistics service firms' service performance. Logistics service firms should pay attention to adopt more efficient logistics technologies to provide better services for their customers. In our study we examine the view of interorganizational information systems (IOS) connecting the logistic firms with inter- and intra organizational factors. We provide a conceptual model for adopting RFID technology in the logistics industry. We will investigate the influences of adopting new technologies on supply chain performance and which key organizational factors can affect RFID adoption in supply chains. Finally, we propose several distinct avenues for future applied research in this area.

Literature and related hypotheses

Advantages and disadvantages of RFID adoption in the logistics industry

Some have claimed that RFID has the potential to greatly improve supply chain efficiency and effectiveness because it enables companies to track product information and allows for greater control and flexibility in managing goods as they move through the supply chain (Jabjiniak and Gilbert, 2004). Ideally, when RFID becomes fully implemented in distribution centers, it will eliminate the need for bar code scanning and manual counting at receiving docks. RFID can facilitate the exchange of necessary information in real time and can help resolve communication problems among supply chain members. RFID location tracking-based delivery planning has been used in the shipping yards of automotive assembly plants, improving visibility and allowing workers to make appropriate operational decisions in terms of vehicle deployment and load makeup (Kim et al., 2008). According to Vijayaraman and Barbara (2006), RFID can help grocery supply chains to improve operational efficiency and stock level transparency for short shelf-life product distribution.

Yet the adoption of RFID technology is not without its challenges. One obstacle to the widespread use of RFID is the need to control costs while still realizing its benefits (McGinity, 2004). According to Smith and Konsynski (2003), in addition to the cost of the tags, organizations must also consider the costs of applying these tags to products, purchasing and installing readers, integrating the technology into the system, training and reorganizing, and implementing application solutions. The complex system integration involved and the need to manage the volumes of data that RFID creates are still other challenges (Vijayaraman and Barbara, 2006). RFID generates a massive amount of data that need to be stored, processed, and used in real time. Therefore, RFID systems need to be integrated into