Chapter 57
The Use of RFID Technologies for E-Enabling Logistics Supply Chains

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ABSTRACT

This chapter reviews the potential benefits and challenges of introducing Radio Frequency Identification (RFID) technologies as a means of e-enabling logistics supply and distribution systems. It introduces RFID and associated technologies as a catalyst for e-enabling optimised supply and distribution activities. In particular, the emerging role of RFID in integrating logistics supply chains is considered key to aligning tasks and achieving operational efficiencies. Other benefits include better visibility resulting from proactive task and process management, and improved risk assessment associated with better data accuracy/quality. In addition, the optimisation of planning and control functions is enhanced through the introduction of key RFID technologies and their integration into logistics systems and operations. Finally, the use of RFID technologies is reviewed in a variety of diverse sectors and areas, from assisting humanitarian efforts through solutions aimed at recovering from the effects of natural disasters to providing accurate and effective methods of recording race times for the Los Angeles marathon.

INTRODUCTION

Logistics and supply chain management are key areas where developments in Information and Communication Technologies (ICTs) are enabling a paradigm shift in the evolution of traditional business practices. The introduction of e-logistics and e-supply chain management has brought on new challenges in the way that tasks are fundamentally assigned, executed and managed, from an operational as well as an organisational perspective. The adaptation and use of e-enabled technologies such as RFID has resulted in optimisation gains across extended logistics and manufacturing supply chains. The immediate availability of information and the dynamic nature

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of data enables amongst others, better visibility, more agility, more awareness, better pro-activeness and better decision support, all of which translate to higher efficiency gains. In this Chapter, we aim to introduce RFID technologies and demonstrate their positive impact on e-logistics and e-supply chain, in supporting and enabling the overall optimisation of operations management practices required to maintain competitiveness.

A historic overview of the development of RFID technologies shall be presented, and examples of key RFID applications and their use will follow. Case studies shall be presented demonstrating the challenges of introducing RFID technologies and their potential benefits.

The objective of this chapter is to critically review recent developments in the field of RFID technologies, and to discuss their suitability, adaptation and use in a variety of sectors, from production to services. The aim is to familiarize readers with the challenges associated with the various types of RFID technologies available and to present examples of their use in the fast evolving e-logistics and e-supply chain sectors. The special focus of this chapter is to identify suitable methods of integrating the extended logistics supply chains through the use of RFID technologies, in order to enable visibility and competitiveness

On a critical note, the suitability of RFID technologies will be discussed in depth, demonstrating that RFID is not a "one size fits all" solution, rather an e-enabled approach for optimally aligning and integrating key logistics operations with a focus on sustainability and competitiveness. We will present a critical review of the literature, supporting key arguments and identifying areas of future research.

BACKGROUND

Radio Frequency Identification (RFID) is defined as a type of wireless information and communication technology, which has the ability to identify, record, verify, and process data associated with various tangible items, such as physical location of goods and the associated movement or variations thereof, as well as supporting intangible tasks, such as information processing and data execution operations associated with the provision of services.

Examples of data and information pertaining to tangible goods, which are typically captured by RFID systems are inventory quantities measured against time, date and location. Other types of measured data may include monitoring of ambient conditions, such as temperature, humidity and/or pressure, which make the use of RFID very appealing to specific sectors, such as perishable goods and pharmaceuticals. RFID has a wide use in many diverse sectors, from retail to banking, particularly in the areas of inventory management and control, such as tracking and security. RFID is key in supporting e-logistics and e-supply chain operations through its ability to exchange information with systems such as Enterprise Resources Planning (ERP) systems. The integration of RFID with ERP systems and more recently cloud computing, offers new opportunities for enabling visibility, particularly in supply chains, where the exact location and movement of parts enables proactive planning and control, thus enhancing efficiencies and enabling competitiveness.

The roots of RFID date back to World War II and were born out of necessity to identify friendly or enemy aircraft in the air. This system, which is still in use to this day in the form of radar, was called Identify Friend or Foe (IFF). IFF used transponders placed on-board the friendly aircraft which, when interrogated by base radar stations, would return a unique code identifying them as being friendly or, in the absence of this code, the enemy. After the war, and in particular in the 1950s, IFF evolved further as many military spinoffs do, and is common place in both military and civil aircraft flying today (Roussos, 2008).

More applied developments of RFID took place in the 60s and 70s, primarily by the Los