Chapter 6.3
Intelligent Supply Chain Management with Automatic Identification Technology

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ABSTRACT

RFID-enabled business models are proposed in this chapter to innovate supply chain management. The models demonstrated benefits from automatically captured real-time information in supply chain operations. The resulting visibility creates chances to operate businesses in more responsive, dynamic, and efficient scenarios. The actual initiative of such novel RFID enabled applications is therefore to encourage intelligent supply chain management to dynamically respond changes and events in real-time. As the RFID implementation costs are continuously decreasing, it is expected that more novel business models would be inspired by the technological advancement to foster more intelligent supply chains in the near future.

INTRODUCTION

Enterprises have been experiencing significant changes in the realms of technology, organization and management, due to increasing demands on the agility, flexibility, customization, and collaboration in supply chains. There is a pressing need to improve the process visibility and to facilitate supply chain wide decision-making through strategic business intelligence to sustain enterprise

competitiveness (Krishnamurthy, 2002; Srinivasa & Swarup, 2002). One of the important enabling technologies to build up business intelligence is the identification and tracking technology, with which the product-centric information resources and associated decision-making systems can be established within and beyond enterprises (Davie, 2002). The information about product movements is crucial to the supply chain efficiency, agility, and product safety (Jakobs, Pils, & Wallbaum, 2001). Product identification and tracking technologies have been developed over time—from paper based manual recording systems to the "semi-automatic" barcode technology associated with optical-digital data processing systems. In recent years, a wireless identification technology, radio frequency identification (RFID), has attracted increasing attentions in supply chain management. Many trials have been implemented with recognized benefits including improved traceability, reduced labor costs, increased speed, greater responsiveness, and better product quality.

A networked RFID system integrates local identification and tracking data with a networked supply chain system through Internet. Unlike barcode systems, the RFID technology can remotely identify physical objects instead of visual alignment of each product with a scanner. It can communicate with multiple products simultaneously and dynamically update the data on RFID tags. The technology provides opportunities in automation of the data capture, item-level product visibility, and particularly in the business process transparency, integration and collaboratively decision making. Therefore, integrated RFID systems are of greater potential to enhance the intelligence of supply chain management than traditional identification technologies.

This chapter will focus on the RFID-enabled intelligence for innovation of the enterprise operations and supply chain management. The barcode and RFID based identification technologies are reviewed in the second section. The models which gain benefits from RFID applications are described in the third section. The conclusion is given at the end of this chapter.

IDENTIFICATION TECHNOLOGIES AND ASSOCIATED SYSTEMS

The RFID technology is one of the efficient identification technologies. Other technologies include one-dimension barcodes, two-dimension barcodes, DNA based bio-barcodes, and global positioning systems (GPS). Although advantages of the RFID technology have been broadly recognized in the past few years, the (one dimension or linear) barcode system has been a dominant identification technology for the last two decades. In this section, we will review technical details of the RFID and linear barcode systems.

The Barcode Technology and Associated Systems

A barcode is a data carrier which stores data as a series of stripes with different widths and with different spaces between them as seen in Figure 1. The data can be captured by a scanner or reader which requires positioning closely in line with the printed stripes. The scanner uses a laser beam that is sensitive to the reflections from the image pattern on a barcode label. The scanner translates the light signal into digital data that is transferred to an associated computer system (Mallah, 2005). The barcode technology has been

Figure 1. An example of the barcode prints (Source: EAN International, 2003)