Chapter XXXIV
RFID and Supply Chain Visibility

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ABSTRACT

Supply chains have become increasingly complex and interdependent in the globalization era. Regulatory authorities are demanding stricter customer compliance, and customers are demanding real-time data for better decision making. At the same time, customer demand is becoming more erratic thus the need for enhanced supply chain coordination with an objective to enhance overall customer value. Radio Frequency Identification RFID, an enabler of supply chain visibility, has the potential to provide customers with large amounts of information at any point in the movement of goods through the supply chain. This technology complements the barcode technology. However, with the acceptance of RFID technology, several managerial and technical issues arise. The focus of this chapter is to thus discuss the relevance of RFID technology for enabling supply chain visibility and adoption related issues.

INTRODUCTION

Increasing efficiency and cost reduction have been the primary value creating strategies for traditional supply chains (Kalakota and Robinson 2002). However, today's supply chains are much more complex, inter-twined and messy primarily due to increasing globalization. Uneven demand, more frequent and shorter order-to-shipment times, and stricter customer compliance requirements are the key parameters that influence today's supply chains. As a result, companies are re-examining their business processes from a business-to-business (B2B) commerce perspective in an effort to be more effective and efficient. The value for today's supply chain lies in the flexibility in procurement, execution, and visibility across the entire supply chain

as well as in managing reverse logistics. Supply chain design must accommodate requests by fickle customers who change their mind after the order is placed so that the company retains control of the manufacturing and fulfillment processes.

Improving flexibility entails improving supply chain coordination for which new tools are required (Kalakota and Robinson 2002). While the Internet has been a primary enabler of many supply chain coordination activities, mobile applications such as mobile phones are beginning to play a central role in enabling *real-time* supply chains. Most traditional supply chain applications have been hindered by the inability to obtain real-time data on attributes such as accurate customer demand and the ability to track assets in transit. Customers want real-time order status information and demand greater visibility into the supply chain execution processes. They increasingly expect to be able to find out the location and status of their orders whenever, and from wherever, they want. To better monitor and optimize asset utilization, they need visibility into the pipeline inventory, inventory at rest (inside a factory or distribution center), and a real-time view of their assets. Customers also want immediate notification in case of the failure to meet the standards outlined in the company's delivery terms and service agreements by supply chain performance. Supply chain visibility requires the technological ability to match a unique customer transaction with the customer's products as these products flow through the supply chain. This matching process is often done manually or through visual inspection which increases the potential for error. The utopia is to have technologies that, using either a customer serial number or pallet, enable the tracking of products from the original product components to the product's receipt by the customer. As a result, companies are investing more in real-time asset tracking. These investments help companies achieve inventory reductions, eliminate sources of order fulfillment variance, reduce leakage, and hence fewer returns.

SUPPLY CHAIN VISIBILITY ENABLERS

A range of technologies, such as barcodes, biometrics, machine vision, magnetic stripe, optical card readers, voice recognition, and smart cards have been developed for automated data collection to augment Enterprise Resource Planning (ERP) (Gupta 2000). Barcodes are already widely used to improve supply chain efficiency especially in quick checkouts at supermarket counters. Since its adoption thirty years ago, it has enabled the creation of important new applications ranging from tracking customer buying habits to managing inventory. The U.S. Postal Service uses bar-coding as a way of identifying product shipments and to gain greater visibility into a product's physical location and status as it moves through the chain. The barcode is an excellent example of the power a single technological innovation can have in changing core business processes.

However, bar-code technology alone is insufficient for handling changing customer demand towards greater supply chain visibility. Radio Frequency Identification (RFID) technology, which permits tagging and tracking of physical goods, is considered a significant improvement over the conventional barcode, which needs to be read by scanners in a line-of-sight fashion and can be stripped away if the paper product labels get ripped or damaged (Angeles 2005). RFID can also facilitate inter-organizational E-Commerce initiatives such as continuous replenishment or vendor-managed inventory (Smaros and Holmstrom, 2000).

HOW DOES RFID WORK?

The RFID value chain involves three parts: tags, readers and enterprise integration software that power these systems. The data generated by the application software can interface with other systems, such as, ERP, Supply Chain Management (SCM) and Customer Relationship Management (CRM), used in an enterprise (Figure 1).

There are three types of RFID tags: active, passive and semi-passive. When most people talk about RFID, they talk about passive tags. In passive tags radio frequency is sent from a transmitter to a chip or card. Passive tags do not have power cell and it uses the transmitted signal to power itself long enough to respond with a coded identifier. This numeric identifier really carries no information other than a unique number, but keyed against a database that associates that number with other data, the RFID tag's identifier can evoke all information in the database keyed to that number. An active tag has its own internal power source and can store as well as send even more detailed information. Active tags are traceable over a much longer distance than passive tags which work within a specific range of one meter (Curtin et