Chapter 6.4
When Does RFID Make Business Sense for Managing Supply Chains?

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ABSTRACT

Radio frequency identification (RFID) is believed to change how supply chains operate today. While RFID's promise for improved inventory visibility and automation in inventory management is making many supply chain players hopeful for increased sales and reduced operating costs, these benefits do come at a cost and involve risks. This article presents a financial returns analysis that captures RFID's costs and benefits, and quantifies the financial risks of implementing RFID for various business sizes and products with different unit profits to understand when RFID makes business sense. More precisely, the returns analysis is performed using an econometric model to understand how break-even sales volumes, unit profits, tag prices, return on investment, and risks vary between a manufacturer and a retailer in a supply chain. The results are extended to multiproduct cases as well. A sensitivity analysis is also performed to understand the returns in pessimistic and optimistic scenarios.

INTRODUCTION AND SCOPE

Efficient supply chain management is a crucial determinant of being a successful and profitable business. One possible way to achieve increased efficiencies in supply chains is through the use of Radio Frequency Identification (RFID), which can enhance decision making capability of information and decision support systems through accurate real-time data collection. RFID is the automatic identification and tracking of objects using radio frequency transmission. The objects can be practically anything such as cars, library books, toll tag devices, live animals, or even persons like hospital patients (Chao, Yang, & Jen,

2007). RFID tags store product information in an electronic product code (EPC). As illustrated in Figure 1, EPC from various RFID tags (that can be at item, box, container and truck level) is read via readers, and gets communicated to a middleware software (also known as Savant) which then identifies detailed information about the detected product from several database servers (known as the object naming services (ONS) and product markup service (PMS) servers). Next, the detailed product information gets communicated to local information system databases which in turn is fed into various enterprise resource planning (ERP) and supply chain management (SCM) applications for supporting planning and execution decisions. (The reader can refer to Terry (2004) and Laran (2005) for more details on the information systems architecture and Wamba, Bedavid, Lefebvre, & Lefebvre (2006) for a description of a system architecture in a retail sector implementation.)

Although radio frequency technology has been known for a long time, the popularity of RFID is rising nowadays because of the decreasing price of the tags, advances in EPC standards develop-

ment, and the mandated adoption of RFID by US Department of Defense and large retailers such as Wal-Mart, Target, and TESCO for all of their top suppliers (Spekman & Sweeney II, 2006).

RFID Benefits

With recent advances, it seems that RFID deployment has a big potential to transform supply chain management as it automates identifying and tracking the items through the entire supply chain, and creating a virtual database that is attached to the product. As described earlier, this data can be fed into supply chain information systems to enhance supply chain visibility (as illustrated in Figure 1), and enable a better management of inventory by reducing inventory and shrinkage especially when shared between different supply chain players. As reported in Lee and Ozer (2007), in current supply chain management information systems the inventory records do not reflect the actual on-hand inventory. They state that this discrepancy "has a daunting effect on the resulting operating costs and revenue" (p.44), which

Figure 1. RFID system components and integration to the Information Systems (based on Laran, 2005)
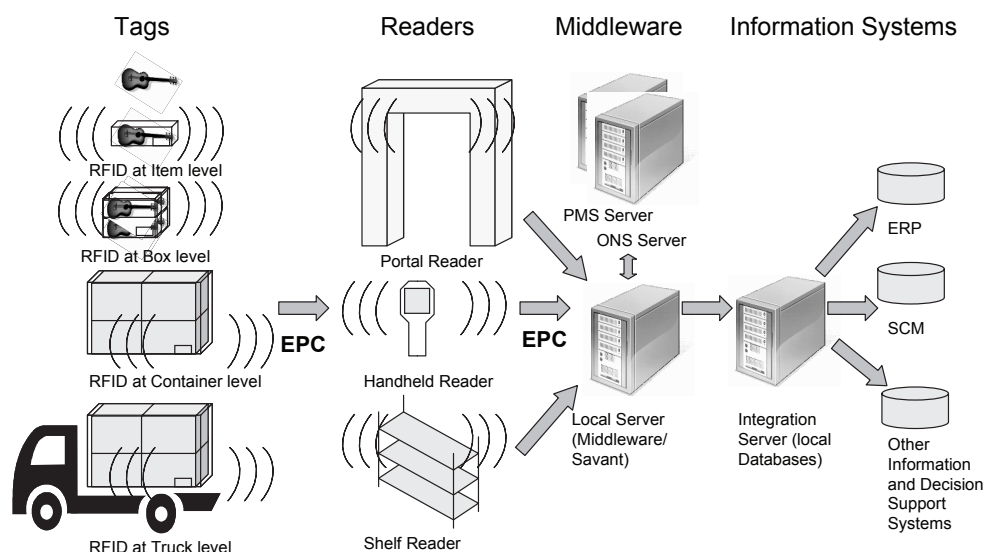
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