Chapter 10
Radio Frequency Identification Systems Security Challenges in Supply Chain Management

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ABSTRACT

The radio frequency identification (RFID) is a wireless technology that enable automatic identification and extraction of stored information from any tagged object within a supply chain environment. A simple RFID system uses radio waves to collect and transfer data from a tag attached to an object linked to an RFID reader for identifying, tracking, and data capturing. However, RFID-based systems have numerous security- and privacy-related threats for the deployment of such technology in supply chain automation purpose. This chapter explains the technical fundamentals of RFID systems and its security threats. It also classifies the existing security and privacy threats into those which target the RFID components such as the tag, the communication channel, and the overall system threats. Finally, the chapter discusses the open research challenges that need further investigation, especially with the rapid introduction of diverse RFID applications in supply chain management (SCM).

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INTRODUCTION

All business today understands the value and importance of building an effective supply chain, as part of organizational growth and profitability (Pal, 2019). A supply chain is a network of business facilities and distribution options that performs key functions: raw material procurement, transformation of these materials into intermediate and finished products, and distribution of these finished products to warehouses; and finally, from warehouses to retail customers (Pal, 2017). Supply chain management (SCM) uses various approaches to integrate suppliers, manufacturers, distributors in performing their functions, and to provide the appropriate strategy to deliver products and services to customers in the right quantities, to the right locations and the right time to meet the required service level with optimal cost. Through collaboration and information sharing SCM system can produce efficient value-added services to its customers and create competitive advantage in the market place. An integrated diagrammatic representation of market specific supply and demand information, warehousing and distribution details along a supply chain, is shown in Figure 1.

Managing a supply chain involves numerous business decisions about the flow of information, product, funds, and their coordination. SCM has been instrumental in connecting and smoothing business activities as well as forming various kinds of business relationships, for example - customer relationship management (CRM), supplier relationship management (SRM), among supply chain stakeholders. In this way, SCM is a complex coordination mechanism to manage the total flow of a distribution channel from supplier level to production, distribution and then ultimately to the end customer. The aim is to achieve goals related to total system performance rather than optimization of a single phase in a logistics chain. The objective of SCM is to enhance productivity by reducing total inventory level and cycle time for orders. It is important for supply chain business-partners to create a network that is agile and able to respond rapidly to unpredictable changes in demand. To achieve these objectives close cooperation among business partners is essential.

SCM system utilizes modern Information and Communication Technologies (ICT) to acquire, interpret, retain, and distribute information. RFID –based technological solution provides a major advantage to SCM. Implementing supply chain collaboration along with RFID technology can enable retailer to achieve the best level of business performance. Retailers can expect extensive inventory and labour-cost savings. In fact, the retail industry (with such major retailers like Walmart and TESCO in the USA, and United Kingdom’s Mark & Spencer and Germany’s METRO Group) is the initial driver of RFID technology adoption in business operation.

In recent decades, RFID technology has been used in many supply chain coordination activities: manufacturing, transportation and logistics operations. Associated with the integration of RFID technology in business and in the day-to-
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