Chapter 4
A Content Analysis for Evaluating RFID Applications in Supply Network Management

Maria Grazia Gnoni
Università del Salento, Italy

Alessandra Rollo
Università del Salento, Italy

ABSTRACT

Traditionally, a supply network is a sequence of different and multiple numbers of processes intercon-nected each other in order to satisfy all capacities and demand requirements imposed by customers with minimum cost to the network. Radio Frequency Identification (RFID) technology could potentially improve supply network management by guarantying more visibility and real time communications across actors. Currently, RFID has playing an important role in coordinating information in several industrial contexts: in brief, its main advantage is to improve the quality and the speediness of infor-mation sharing among different partners in a network. Moreover, RFID capability could be effectively applied to replace traditional approaches (i.e. barcodes) to store and retrieve item data. On the other hand, RFID application is affected by some criticisms from both technological and economical point of view, as all emerging ICT technologies. In recent years, several studies have been developed in order to analyze benefits of RFID applications; few papers are focused on analyzing evaluation frameworks for RFID applications in complex supply networks. The proposed content analysis aims to support in evaluting potential operational benefits of RFID technology in different supply networks. The analysis proposed has been developed according to the well-know Supply Chain Operations Reference (SCOR) which allows integrating business process reengineering, benchmarking, and process measurement into a cross-functional framework. The content analysis has been developed according to current literature about RFID applications; finally, it is proposed a standardized guideline for evaluating potential benefit of RFID technology in supply networks.

INTRODUCTION

Supply Network Management (SNM) is currently characterized by a high level of complexity mainly due to the dynamicity of several critical factors (e.g. market demand, supplier performances, etc.); effective coordination strategies could determine significant opportunities for improving profit margins and reducing cost (ElMaraghy 2008). In the context of supply chain networks, involved actors usually work at different geographical locations; items have to be delivered in a quick and effective way. At supplier level, decentralized processing requires a common integration layer both on technological and organizational level in order to provide a dynamically controlled supply chain network (Baina 2009, Che 2009). Innovative frameworks, which affect either technological and organization issues, are developing aiming to design more effective collaborative networks (Foster, 2008).

One interesting research topic is represented by the definition of indicators for accurate monitoring and measurement of supply network performances (Chow, 2007). This issue becomes critical if innovative technology tools – such as Radio Frequency Identification (RFID) – are applied in the SNM. The RFID system is based on wireless sensor technology which makes it possible to scan quickly objects and to manage large volumes of multiple data sets. RFID technology could potentially improve the performance of traditional tools – i.e. barcodes –; thus its use is rapidly spreading (Singh, 2008); its capability to store and retrieve item data can be utilized to replace traditional approaches in several industrial contexts such as pharmaceutical, food chains, etc. The application of RFID technology in the SNM could support the whole network to react more efficiently and quickly to changes imposed by market demand and customer requirements: RFID applications could support several advantages in SNM such as a more effective information sharing across the supply network, which allows to support collaborative inventory planning, forecasting, and replenishment management (Vijayaraman 2006). Each physical flow of products, prototypes, raw materials, production assets is associated with clear and complete information "attached" directly to the object shared through the supply chain network. Thus, actors in the network could obtain all information directly with the item.

The faster and higher information availability supplied by RFID systems requires innovative models for managing information in such a level of the supply network (Chao 2007). Moreover, RFID application is affected by some criticism due to both technological and economical point of view as all emerging ICT technologies. In recent years, several studies have been developed in order to analyze benefits of RFID applications in several industrial contexts; few papers are focused on analyzing evaluation frameworks for RFID applications in complex supply networks. In this context, another relevant factor regards the lack of a reference guideline for an effective analysis of RFID technology applications according to the specific industrial context and the technological level of application. One of the most widespread reference model is the SCOR (Supply Chain Operations Reference) defined by Supply Chain Council (SCC, 2009); this approach has been used as a basis for supply chain improvement for global (Morciniec and Yearworth 2006) as well as for site-specific projects (Poluha 2007).

Therefore, the aim of this study was to propose a general framework in order to assess the impact of RFID technology in such a supply chain network. The framework proposed exploits the hierarchical structure of industrial processes proposed by the SCOR in order to highlight dimensions of effective intervention of RFID technology and, consequently, its benefits at each supply chain level. The remainder of the chapter is organized as follows: a quantitative literature review about RFID applications in supply chains is proposed aiming to point out current applications of this technology; next, a content analysis based SCOR process classification is detailed for papers which propose real case study applications.

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