Chapter 2

CostRFID:
Design and Evaluation of a Cost Estimation Method and Tool for RFID Integration Projects

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ABSTRACT

Although many firms have initiated RFID projects, they often face significant difficulties in integrating RFID systems into their existing IT landscape. One such difficulty is the upfront estimation of the cost of the RFID integration project. This chapter addresses this issue by using a design science approach to provide a cost calculation for RFID integration projects. Drawing from literature in the fields of information systems and RFID, software engineering and supply chain management, the authors develop the cost calculation method that is then implemented in a prototype. The prototype is developed and evaluated in an iterative fashion using focus groups, RFID experts, and the cognitive walkthrough method. The authors contribute to theory by proposing a new cost calculation method to estimate the costs of RFID integration projects. Practical implications include a more accurate estimation of the cost of integrating RFID systems into the existing IT landscape and a risk reduction for RFID projects.

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INTRODUCTION

RFID offers several advantages over traditional auto-ID technologies such as higher object identification speed, higher storage capacity, and allows firms to improve processes in the fields of manufacturing, distribution, transportation and retail (Roh, Kunnathur, & Tarafdar, 2009; Roussos, 2006; Rutner, Waller, & Mentzer, 2004; Thiesse, 2005; Want, 2006; Weinstein, 2005). Furthermore, RFID-technology allows for improved data quality and information availability, and therefore enhances intra-organizational operations (Fosso Wamba & Chatfield, 2009), and increases information visibility among supply chain partners (Delen, Hardgrave, & Sharda, 2007; L. Lee, Fiedler, & Smith, 2008). Therefore, many firms are considering investments into RFID technology or have already invested in the technology (L. Lee, et al., 2008). One major aspect of RFID implementation projects is the integration of RFID systems into the existing information technology (IT) systems of the organization so that it can enhance business processes (Strueker & Gille, 2008), and allow firms to optimize information and material flow (Fosso Wamba & Chatfield, 2009). However, the integration of RFID-systems into the existing IT-systems of firms is a complex process that can result in several implementation problems. In particular, the upfront estimation of RFID system integration costs can be difficult due to the complexity and uniqueness of RFID projects, leading to a wrong estimation of the cost and effort required for executing the integration project (Angeles, 2005).

Having relatively accurate project cost estimation is an important factor in the decision making process of firms during the early stages of project planning, and is a well-known issue in the field of information systems (IS) (Boehm, Abts, & Chulani, 2000). Realistic expectations and the definition of clear objectives are necessary for IT projects in general (Hartman & Ashrafi, 2002; Reel, 1999; Smithson & Hirschheim, 1998), and for RFID software projects in particular (Dickson, 2007). Since RFID projects have to integrate hardware and software into the existing IT infrastructure, traditional software cost estimation methods are not suitable for the upfront cost estimation of RFID projects. While RFID system integration has been identified as a major cost factor in RFID-projects, the lack of an appropriate cost estimation method still represents a major drawback for the widespread adoption of the technology (Asif & Mandviwalla, 2005). Being able to calculate the cost at the project outset in advance can help organizational decision-makers to decide if and when to carry out the implementation project, and also decide on the various applications that they can design around the technology by integrating it with other existing IT systems within the organization. Therefore, this research aims to develop a cost estimation method for RFID projects specifically focusing on the integration of RFID into existing IT systems within the organization.

Considering the inter-disciplinary aspects of RFID technology, we draw from the domains of information systems, auto-identification technology and software engineering to develop a cost estimation method for RFID integration projects. The cost estimation method developed is based on established cost estimation methods that exist for software development projects, and in particular draws upon the COCOTS model that incorporates commercial-of-the-shelf (COTS) components in the cost estimation of software projects (Abts, Boehm, & Clark, 2000). Since a typical RFID system infrastructure comprises off-the-shelf components that are configurable (such as tags, readers, middleware) (Maier, 2005; Thiesse, 2005), the COCOTS model is particularly applicable in the context of RFID projects. We further adapt the COCOTS model to take RFID-specific requirements into account, and develop a new cost estimation method for RFID integration projects. The developed cost estimation method is used as a basis for designing the RFID cost calculator tool. The iterative development and evaluation...