

# A conceptual model of RFID's impact on relational value cocreation and appropriation

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## Abstract

With the advances of Internet of Things (IoT), RFID technology is becoming ubiquitous. While prior studies have conceptualized RFID technology as a unidimensional concept or examined its impact from a homogeneous organizational context perspective, little attention has been paid to RFID technology characteristics deployed in a firm and the extent to which they impact this firm's network of business partners in terms of relational value co-creation and appropriation. This study draws from relational perspective and Media Synchronicity Theory and proposes a conceptual model relating RFID characteristics – synchronicity, integration capability, scope of utilization – to relational value creation. Specifically, it proposes that RFID impact depends on the direct and combined effects of individual RFID characteristics on relational value outcomes. These effects are moderated by the quality of partnership between IT and business units in the firm. The conceptual model validation is necessary to assess the predictive power of the emitted hypotheses.

## Keywords

Radio Frequency Identification (RFID), relational value, relational perspective, media synchronicity, co-creation value, value appropriation, IT and business units partnership, asset specificity, idiosyncratic relationship.

## Introduction

Based on recent examples of firms such as Zara chain which is the world's largest fashion retailer, U.K.-based Marks & Spencer, and U.S.-based Macy's, organizations are increasingly embracing RFID (Radio Frequency Identification) technology to organize and structure their business activities around it (Bjork 2014). RFID is an emerging technology that facilitates identification of objects, products, and humans in each value chain activity and disseminates collected information inward and outward of the firm. It attracts considerable interest from the academic and practitioner communities (Ngai et al. 2008b). Its expansion and integration will significantly increase in numerous areas such as retail, healthcare, transport and logistics, leisure and sports, access control, and ticketing (Reuters 2014). The total RFID market is expected to be worth \$30.24 billion by 2024, which represents the production and sale of RFID tags, readers, software, and related services (ResearchAndMarkets 2014).

A common rationale for using RFID technology is that it optimizes supply chains (Lefebvre et al. 2006), fosters collaboration between business partners (Lekakos 2007), and integrates intra- and inter business processes (Yang and Jarvenpaa 2005). Firms that use RFID technologies capture a huge amount of real-time information on products and client needs and have reduced operational costs. Still, most do not fully harness all that information for business purposes (Curtin et al. 2007). Indeed, as Curtin et al. suggested, assessing the RFID-enabled business value, knowing when to invest and who gets what benefits, and understanding how value is related to the volume of information transmitted are challenging as well critical tasks in order to achieve high-performance RFID-based work systems.

To date, the literature has revealed several aspects of RFID's impact on business value. For instance, we know that, as an interorganizational IT-related system, RFID strengthens relationships inside an "ecosystem" made up of business partners that collaborate with a firm (Quaadgras 2005) such as Zara chain and losses of business value are associated with imperfections such as the technical and organizational constraints of RFID work systems (Curtin et al. 2007). As well, we know that interfirm value creation depends on IT characteristics (Chi and Holsapple 2005), specifically on RFID characteristics deployed in those organizations. Considered as an IT artifact (Curtin et al. 2007), RFID technology should not be used only for pursuing the cost reduction goal but rather for "expertise exploitation," that is, the creation, sharing, combination, and integration of fine-grained expertise to generate performance that is superior to competition (Christiaanse and Venkatraman 2002).

Finally, although RFID fosters a governance structure that facilitates business integration (Lefebvre et al. 2006), it is also used as a bargaining tool at the expense of smaller business partners (Yang and Jarvenpaa 2005). Because it can be a tool to control trading partners, RFID may have a detrimental effect on trust (Yang and Jarvenpaa 2005). Since trust is crucial for long-term inter-organizational relationship development (Bassellier and Benbasat 2004; Reich and Benbasat 2000), RFID technology can yield counterproductive outcomes.

Despite these contributions, much remains to be learned about the RFID's business impact (Barjis and Fosso Wamba 2010; Ngai et al. 2008a) on interfirm relationships. Specifically, there is a knowledge gap related to the effect of RFID characteristics on the cocreation and appropriation of relational value, that is, the business value generated jointly by partners who leverage their idiosyncratic relationships and share knowledge. First, as with any IT artifact, the research done so far on the impact of RFID on business value assumes that a single and homogenous organizational setting exists (Fosso Wamba and Chatfield 2009; Grover and Kohli 2012). Past studies have not demonstrated the mechanism by which relational value is cocreated by firms with different RFID characteristics.

Second, while RFID is increasingly used to facilitate interactions between a firm and its trading partners such as suppliers, manufacturers, and retailers, past research has mainly focused on individual firms – retail stores, distribution centers – or dyadic B2B relationships in the context of supply chain optimization whereas its utilization in a network of partnerships is still rare and constitutes an emergent phenomenon. Specifically, such studies do not explicitly integrate the characteristics of RFID technology and of IT unit/business units partnership in the context of relationship development between trading partners and of knowledge sharing, integration, and combination. Since the relationship development between business partners is complex, it is necessary to examine firms' interdependencies with their environmental characteristics (Adomavicius et al. 2006) to better understand the managerial and organizational implications of RFID characteristics for interfirm performance.

This conceptual paper addresses these gaps by answering the call for research on how the business value resulting from RFID implementation is mediated by other organizational capabilities that drive value conversion, and how long the value lags are (Curtin et al. 2007, p. 102). Thus, the following research questions are posed and addressed:

- (1) What are the effects of the RFID technology characteristics on the appropriation of relational value?
- (2) What moderating and mediating factors underlie this relationship?

The main premise is that a better conceptualization of the RFID technology, relational value cocreation within a network of partnerships, and appropriation of this cocreated relational value by a focal firm is helpful for understanding the RFID's impact on a firm's business performance.

To address these research questions, we use well-established theoretical frameworks from which we develop a research model and hypotheses. Specifically, we use the relational perspective (Dyer and Singh 1998), for which the unit and level of analysis are respectively dyadic relationships between two business partners and the network of relationships comprising a firm and its surrounding business partners. We also use media synchronicity theory (Dennis et al. 2008) to capture the technical dimension of RFID technology in terms of communication and reliance on information synchronicity. Whereas the relational perspective focuses on developing competitive advantage by sharing knowledge and harnessing idiosyncratic relationships within a network of trading partners, media synchronicity theory explains how

some types of media and communication systems can enhance synchronicity and improve communication, and thus promote relationships that minimize opportunism and foster trust.

The main objective of this article is to study RFID's impact on interfirm relationships from the perspective of a firm that operates within a network of trading partners. Specifically, this study seeks to understand the relational value cocreation and appropriation mechanisms within a firm by examining the characteristics of RFID and the nature of the relationships between that firm and its trading partners. In other words, it permits us to understand how the potential of relational value can be fully reached and exploited in organizational settings that use RFID technology.

The rest of this paper is organized in two sections. The first section is about the theoretical background that underlies this study. Within this section, based on specific literature, we define the notion of relational value, of business value cocreation and appropriation, and of IT and business units partnership. Then, we develop a new conceptualization of RFID technology by depicting its technical, organizational, and managerial dimensions in terms of three RFID characteristics: synchronicity, integration, and scope of utilization. Finally, we develop theoretically a research model by putting altogether the variables depicted previously and justify emitted hypotheses. The last and concluding section pertains to the contribution of this study.

## **Theoretical background**

### ***The relational perspective and the cocreation of relational value***

The relational perspective explains how firms in a heterogenous environment jointly create business value, also called "relational value." In such environment, different management logics and actions likely coexist and may contradict each other (Roth and Kostova 2003). Relational value refers to the additional benefits that are commonly created by exchange relationships between business partners, above individual firm effort and benefits created by arm's-length or hierarchy exchanges (Dyer and Singh 1998). It is based on the assumption that a business relationship is a valuable resource that holds potential and actual value. By investing in specific inter-organizational resources, firms can create more relational value than their competition.

The relational perspective has different theoretical assumptions than other well-known theoretical perspectives. For instance, unlike the industrial organization and its derivative Structure-Conduct-Performance model that explains the source of competitive advantage as a firm's ability to belong in an attractive industry and adopt diverse strategies to sweep aside new entrants (Porter 1985), the relational perspective's focus is outside the firm formal boundaries, specifically its network of relationships.

Similarly, unlike the resource-based view that explains competitive advantage as the result of combining and renewing internal, rare, inimitable, and difficult-to-reproduce resources (Wade and Hulland 2004), the relational perspective focuses on the development of dedicated tangible or intangible assets between a firm and each of its business partners as they cocreate value. It is based on the economic notion of "asset specificity," that is, the level of asset customization to each specific partner's business needs, processes, and context. An asset is specific if it is committed to the development of an idiosyncratic relationship with a specific partner.

The conditions under which firms generate above-average relational value are established at two levels: the business partners' network that permits joint value creation and the firm that appropriates the cocreated value. At the cocreation level, firms should safeguard their relationships from opportunism by using either contractual mechanisms or long-term relationships based on trust and on dedicated assets that support high volume exchange (Dyer and Singh 1998). At the firm level, firms appropriate cocreated value by using property rights and patents from the outcomes of innovation or by leveraging complementary organizational capacities such as the distribution network, marketing, and manufacturing capabilities (Ceccagnoli et al. 2012). According to Ceccagnoli et al., relational value appropriation is crucial since its level predicts the one of the return-on-investment benefits that can be cocreated. In this article, we focus on value appropriation only in the form of complementary capacities since it is "the most efficient way of securing innovation outcomes from a large sample of industries" (Ceccagnoli et al. 2012, p. 266), difficult to imitate by the competition, and a source of competitive advantage (Teece 1986).

In sum, although the relational perspective is about creating competitive advantage by sharing firm's resources with business partners in order to gain access to their resources through dedicated assets (Dyer and Singh 1998), cocreating relational value is quite challenging as it requires well-orchestrated and effective coordination and integration efforts between firms in order to cope with uncertainties coming from reciprocal and interdependent tasks (Mintzberg 1979; Thompson 1967; Van de Ven et al. 1976).

### ***A new conceptualization of RFID technology***

We view RFID technology from a broader perspective, taking into consideration its technical, managerial and organizational dimensions. First, we define RFID technology as a type of "IT artifact embedded in IT-reliant work systems that has specific technical, mobility, organizational, and managerial implications for handling the temporal control of the collection of relevant data that has been traditionally difficult and costly" (Curtin et al. 2007, p. 101). According to Curtin et al., RFID's information collection capability spans organizational environments and business units, links together key information systems, and goes beyond the constraints imposed by location, space, and time. Moreover, we consider RFID technology as a generic infrastructure that has a "plug-and-play" functionality but is not the primary driver of business value *per se*.

Second, we adopt the contingent – rather than the determinist – approach to IT by integrating contextual and organizational factors into our conceptualization (Brynjolfsson and Hitt 2000; Fosso Wamba and Chatfield 2009). The contingent approach lets us disaggregate RFID technology into ever-finer "RFID dimensions" – synchronicity, integration capability, and scope of utilization – in order to obtain, as suggested by Aral and Weill (2007), a micro-vision of the effects of RFID investment on the value cocreation and appropriation processes.

Leveraging the concept of "IT synchronicity" (Dennis et al. 2008), we define RFID synchronicity as the level of communication capabilities provided by RFID technology that lets several persons or organizational entities working together and having the same goals in order to share the same behavior and coordinated pattern. Building on the "IT relatedness" concept (Tanriverdi 2005), we define RFID integration capability as the ability of a firm to have RFID resources (e.g., material, software, communication tools) and to put in place RFID management processes for integrating and sharing its internal systems with its business partners' systems. We define RFID scope of utilization as the depth and number of a firm's business partners that use RFID technology.

Third, we conceptualize the set of RFID-enabled inter-organizational effects as a "domain activity" that should be integrated into an organizational context. As an activity domain (Tushman and Romanelli 1985), RFID technology should be managed based on three logics: economic, sociopolitical, and sociotechnical. The economic perspective posits that RFID management should meet the firm's effectiveness and efficiency requirements. As suggested by Brown (1995), RFID technology should also respond to the sociopolitical imperative by establishing its legitimacy within the firm's IT unit, the entire organization, and the business partners' network. Finally, RFID technology should be aligned with firms' goals and needs and foster the development of long-term business relationships to ensure the cocreation and appropriation of relational value.

As suggested by Barki (2008), we argue that these three dimensions – RFID integration, synchronicity, and scope of utilization – represent complementary aspects that together tap into the content domain of the RFID construct. They reflect respectively the economic, sociotechnical, and sociopolitical logics. RFID integration reflects the economic logic since as IT integration facilitates reactivity, resource sharing, and cross-spanning synergies between firms (Tanriverdi 2005). We argue furthermore that integration reflects the *inside-out* dimension of RFID. Inside-out resources are deployed from inside the firm in response to market requirements and opportunities for cost control and reduction (Wade and Hulland 2004).

RFID synchronicity reflects the sociotechnical imperative as IT synchronicity captures the ability to deal with geographic dispersion and time constraints affecting business partners' collaboration (Dennis et al. 2008). We argue that it reflects the *outside-in* dimension of RFID as information synchronization occurs by scanning, capturing information on mobile entities, and disseminating them into firm's back-end and external systems. As an outside-in resource, it contributes to establishing durable customer relationships and understanding competitor behavior in terms of market responsiveness and management of external

relationships (Wade and Hulland 2004). RFID scope of utilization reflects the sociopolitical imperative: extending an RFID network to more business partners depends on trust, power, and political influence. We argue that RFID scope of utilization is a *cross-spanning* resource. Cross-spanning resources encourage separate entities to collaborate and share knowledge (Wade and Hulland 2004).

Finally, we support the idea that, as an IT artifact, RFID technology indirectly impacts firm performance by acting on intermediaries' organizational and operational processes (Aral and Weill 2007; Sambamurthy et al. 2003), such as the value cocreation and appropriation processes. As suggested by Tallon (2008), the more RFID functionalities are used and deployed in a complementary manner with inter-organizational resources and are integrated at the core of inter-organizational business activities, the more those functionalities will contribute to organizational and inter-organizational performance. Hence, we consider the three RFID functionalities as acting directly and indirectly to cocreate business value in a network of partners.

### **Synchronicity**

We borrow from media synchronicity theory (Dennis et al. 2008) to explain the relevance of RFID synchronicity in our conceptualization. According to this theory, two processes are involved whenever two parties communicate: conveying of information and convergence of meaning. The former reflects information transmission and processing regardless of the information's length and diversity. Convergence of meaning refers to the interpretation of information and the communication context that makes both parties to share the same meaning of a given reality.

Since each RFID system includes middleware software that centralizes business decision rules to ensure automatic interpretation and semantic transformation of collected data (Fusheng and Peiya 2005), we posit that both communication processes are necessary in a RFID context. Synchronicity and communication performance are related to media characteristics such as symbol sets, parallelism, rehearsability, transmission speed, and reprocessability. Symbol sets represent the number of ways a message might be encoded before it is sent. Parallelism refers to the number of simultaneous transmissions from diverse sources permitted by the media. Rehearsability reflects the number of times an emitter might modify and enhance its message before sending it. Reprocessability reflects the number of times a media allows a message to be revised and retransmitted. Synchronicity is related to the notions of "time specificity" and "asset specificity." Information is time-specific if its value is related to communication in a specific period of time when it is still relevant.

Finally, media synchronicity theory informs us that firms vary in their ability to possess diverse technologies, which are adapted and used variably depending on the tasks and communication characteristics occurring within them. Possessing the appropriate media and using them optimally by alternating and mixing the convergence and conveyance processes according to business needs provide better communication performance.

In our conceptual model, RFID synchronicity captures the technical dimension of RFID technology. It captures the information communication and synchronization aspects of RFID utilization in a firm. As RFID is made up of tags – passive, active, or semi-active – readers, and middleware – from different vendors, RFID-generated communication may be altered by constraints such as standards, equipment prohibitive cost and incompatibility, information collision, and geographical distance (Barjis and Fosso Wamba 2010). Although RFID technology enables the synchronization of information flows between supply chain members (Fosso Wamba and Boeck 2008), reading tags and disseminating huge amounts of real-time information in a mobile environment and across organizational boundaries can impede substantially RFID synchronicity and ultimately business value without an appropriate mix of conveying of information and convergence of meaning.

### **Integration capability**

Research suggests that RFID infrastructure must be interoperable and integrated with a firm's existing information systems if it is to generate business value (Brown and Russel 2007; Loebbecke and Palmer 2006). For example, RFID-generated data must be shared with business partners so the data can be jointly exploited for business intelligence activities such as market and client consumption knowledge development (Lekakos 2007). RFID integration is crucial as the RFID middleware plays a central role

(Fusheng and Peiya 2005): it is connected to RFID readers, events and data flows, and interacts with internal and external systems and legacy systems (Forrester Research, 2004).

Since RFID technology is about traceability of entities and producing massive amounts of data as those entities move across system boundaries and physical facilities, RFID integration can be challenging. In our conceptual model, RFID integration capability captures a firm's ability to integrate RFID information into a firm's internal and external information systems.

### **Scope of utilization**

Past studies indicate that the number of actors and the value chain area where RFID technology is used have an impact on returned business value. For example, when more supply chain actors use RFID, a substantial positive impact may be distributed along the value chain (Boeck and Fosso Wamba 2008). According to Boeck and Fosso Wamba, when RFID tagging occurs at the upstream end of the supply chain, then RFID's impacts and network externalities will likely be substantial. These insights are coherent with the finding that information value in a supply chain is positively correlated with the number of actors involved in that exchange (Wareham et al. 2005).

Moreover, when RFID is not implemented with all trading partners, a firm may continue to manually handle systems in parallel, which reduces value (Curtin et al. 2007). Since the development of RFID infrastructure is costly and creates substantial overhead, RFID technology is most suitable for firms that have substantial amount of diversified products and services to track and identify (Park 2007).

In our conceptual model, RFID scope of utilization captures then the scope of the technology's use, as measured by the diversity and depth of the partners that use it.

### ***The IT unit and business units partnership as the moderating factor***

We integrate into our conceptualization the impact of partnership between the IT unit and the business units of the focal firm since, according to Agarwal and Sambamurthy (2002), firms that invest heavily in enterprise digital platforms such as wireless technologies to support innovations in their "ecosystems" need a strong partnership between these different units.

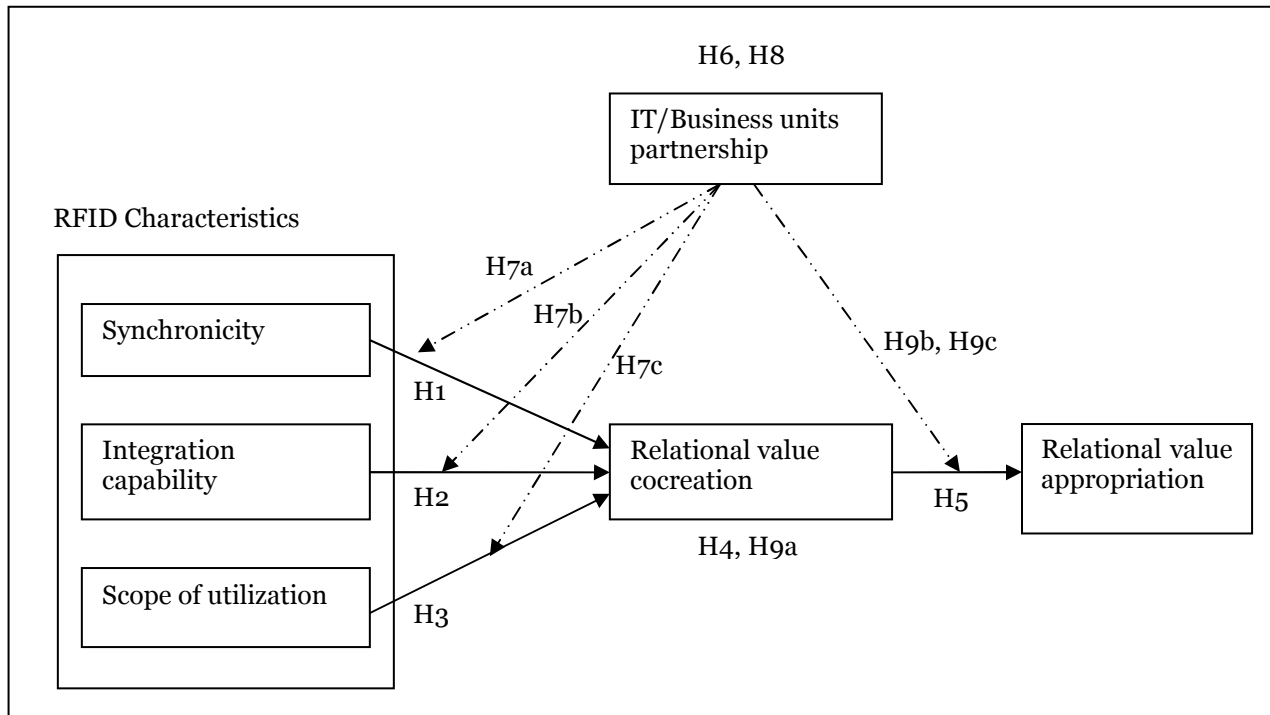
IT/business units partnership involves the "creation and maintenance of social and business relations that reflect long-term commitment, mutual cooperation and goal sharing, risk, and benefits sharing between the IT function and the rest of the enterprise" (Henderson 1990, p. 8). It assumes that IT performance in a firm can be significantly improved through joint and mutually dependent actions. It fosters trust between IT unit and staff in other business units while decreasing risk factors for IT projects (Reich and Benbasat 2000), such as the ones related to RFID technology. It reflects the coexistence of the social and technical dimensions of IT management and the tension between managing internal IT unit while taking into consideration the business needs from the rest of the firm (Reich and Benbasat 2000).

The IT/business unit partnership lets develop a common knowledge and experience domain for IT-enabled business activities (Reich and Benbasat 2000). Sharing cross-knowledge fosters collaboration between the IT unit and the rest of the firm (Carter et al. 2011) and helps IT unit to gain support from business units' managers and access resources (Enns et al. 2003) to use, for instance, for RFID projects. Because it can combine IT resources with complementary organizational resources and align IT with business practices (Chan et al. 1997; Oh and Pinsonneault 2007), this partnership is crucial for effectively coordinating reciprocal, and interdependent tasks between the IT unit and the business units (Chatterjee et al. 2002).

Moreover, since the IT unit promotes cross-business units and enterprise-wide utilization of IT assets and platform and of capability development in order to reduce IT cost and leverage synergies (Agarwal and Sambamurthy 2002), we argue that RFID technology should be managed under IT unit. Hence, we conceptualize IT/business units partnership as the moderating factor between RFID technology and relational value cocreation and appropriation because it provides the enterprise-wide IT context under which RFID projects are designed, implemented, and used by internal users or business partners.

### The research model and hypotheses

We develop a research model (Figure 1) by integrating the variables described in the theoretical background section and justifying the relations between them. The model highlights the mediating and moderating factors that act upon the relation between RFID technology and relational value appropriation. Following Baron and Kenny (1986), this research model helps one understand the conditions under which RFID characteristics – synchronicity, integration capability, and scope of utilization – emerge and have their effects amplified through the impact of the moderating factor, that is, the IT/business unit partnership. Stated differently, this research model explains the mechanism by which the RFID characteristics’ effects appear via the mediating and moderating impact, which may decrease or increase their effects on relational value appropriation. Then, we develop research hypotheses that predict the various relationships shown in the model.



**Figure 1. The proposed effects of RFID characteristics on relational value cocreation and appropriation**

#### The direct effect of RFID synchronicity on the cocreation of relational value

RFID synchronicity captures the technical aspects, specifically the real-time transmission of high volume of data that should be integrated inward and outward of the firm for business decision-making. Since greater asset specificity induces a higher level of coordination between partners’ activities and generates complex and diverse communication needs (Mithas et al. 2008), RFID synchronicity becomes crucial for cocreating relational value in a network of partnerships.

When the need for meaning convergence and information conveyance grows because of the increasing number of business partners involved in RFID exchange, the partners’ RFID technologies must be synchronized, time-specific, and adapted to different communication and exchange requirements. As geographic dispersion has a negative impact on interfirm collaboration (O’Leary and Cummings 2007; Olson and Olson 2000) and on business activities’ coordination and communication (Hymer 1976), RFID technology needs to be time-specific and a synchronization tool for each business partner in order to face the geographical dispersion.

However, RFID synchronicity may have detrimental effects on relational value cocreation because of RFID’s imperfections, as well as geographic dispersion. By generating communication errors and time-

delayed responses, high-volume RFID data capturing and processing could have adverse effects by harming parallelism, transmission speed, rehearsability, and ultimately undermining trust and fostering opportunism between partners. This could impede relational value cocreation. Therefore, a minimum level of synchronicity is required among business partners if RFID technology is to provide positive outcomes. Thus, we predict:

Hypothesis 1:

*Beyond some point where RFID technical imperfections are minimal, RFID synchronicity is positively associated with relational value cocreation.*

### **The direct effect of RFID integration capability on the cocreation of relational value**

According to Curtin et al. (2007), RFID value creation entails transforming the massive amounts of RFID-generated data into managerially useful information. RFID integration with internal and external systems enables firms to harness the collected information for business purposes and therefore provides a context for development of lateral relationships, knowledge sharing among business units within a firm, and development of complementary technologies. Direct links within a network allow the transfer of tacit, complex, and hard-to-codify knowledge (Hansen 1999), which is beneficial for long-term relationship development.

Moreover, as suggested by Huber (1990), Dewett and Jones (2001), and Galliers (2004), RFID integration capability creates an organizational context that promotes knowledge accumulation and learning at the firm level, the exploration of new experiences, and the exploitation of the acquired knowledge to respond to changing business goals. Stated differently, as firms leverage the similarities and differences among business units by means of integration and coordination mechanisms (Lawrence and Lorsch 1967), RFID integration capability is crucial for discovering, sharing, and generating new knowledge inside the firm using, for instance, IT applications such as data pattern finding and artificial intelligence tools (Chi and Holsapple 2005). We posit that as business goals are influenced both by internal and external forces (Cyert and March 1963), this innovating organizational context resulting from RFID integration capability could be oriented outside the firm for creating and increasing the relational value within a network of partners.

Yet, RFID integration capability presupposes the use of standards and homogenous behavior for integrating disparate internal and external business activities. This standardization may therefore generate adverse effects on building customized relationships and doing RFID investments dedicated to each business partner. We argue that although standardization may impede relationships specificity, RFID integration increases ultimately relational value. Thus, we predict:

Hypothesis 2:

*RFID integration capability is positively associated with relational value cocreation.*

### **The direct effect of RFID scope of utilization on the cocreation of relational value**

The scope of RFID utilization may impact the cocreation of relational value since the existence of a critical mass of users affects network externalities. For example, in the supply procurement context, maintaining an optimal number of suppliers for custom and commodity goods yields better supply chain performance (Dedrick et al. 2008). This optimal position is coherent with the "move-to-the-middle hypothesis," which points out the countervailing risks that go along with the market-based forms of procurement (Clemons et al. 1993) and the difficulty to control the number of transaction partners.

RFID scope of utilization can also produce adverse effects on relational value cocreation when more partners are involved, generating substantial overhead because of the efforts between partners to coordinate reciprocal and interdependent activities (Van de Ven et al. 1976). We therefore argue that RFID scope of utilization should be "in the middle," to ensure a combination of greater access to partners' resources while developing limited number of idiosyncratic partnerships. This threshold position will be beneficial as it mitigates the risk, uncertainties, and expenses related to substantial partnering with several and diverse trading partners. Thus, we predict:



Hypothesis 3:

*In its optimal position with a number of partners that generates minimal overhead, RFID scope of utilization is positively associated with relational value cocreation.*

### **The mediating effect of relational value cocreation on the relation between RFID characteristics and the relational value appropriation**

According to Baron and Kenny (1986), evidence of the mediating effect of relational value cocreation can be established by separately highlighting the evidence for the relationship between RFID technology and relational value cocreation – which was done in the previous section – and the evidence for the relationship between cocreation and appropriation of relational value. The latter relationship is established conceptually by clearly distinguishing these two constructs. As value cocreation within an ecosystem of partnerships and value appropriation are not mutually exclusive (Ceccagnoli et al. 2012) and participation of all actors involved in B2B exchanges increases network externalities that can be captured by individual firms with appropriate absorptive capability (Zhu et al. 2006), we argue that the cocreation and appropriation of relational value are not conceptually identical.

Furthermore, as diverse and complementary insights and experiences emerging from the network of relationships may yield better performance of individual participant firm (Martin and Eisenhardt 2010; Mezas and Glynn 1993; Powell et al. 1996), we argue that the more a firm's business partners adopt and use RFID technology, the more positive outcomes will be generated from its business network (Boeck and Fosso Wamba 2008). Therefore, we posit that the cocreation of relational value within the trading partners' network is a predictor of relational value appropriation by individual firms. Thus, we predict:

Hypothesis 4:

*Relational value cocreation mediates the positive impact of RFID characteristics – synchronicity, integration capability, and scope of utilization – on relational value appropriation by a firm.*

Hypothesis 5:

*Relational value cocreated within a network of partners is positively associated with relational value appropriation by a firm.*

### **The moderating effect of the IT/business units partnership**

Elements such as trust, investments in specific assets, and flexibility in meeting a firm's unforeseen needs by its business partners are difficult to codify in contracts although they have substantial impact on the business activities (Mithas et al. 2008). Since those "difficult-to-codify" elements develop in an organizational context that inhibit or facilitate them, we argue that RFID's impact on relational value cocreation will be moderated by the quality of the IT/business units partnership within a firm.

Indeed, the IT/business units partnership may affect the number and intensity of partnering interactions between a firm and its trading partners by identifying, automating, and streamlining internal business needs directly or indirectly related to RFID information collection and processing and by creating RFID-enabled and inter-organizational business activities. Since asset specificity increases as the number and intensity of interactions between partners increase (Malone et al. 1987), the IT/business units partnership will consolidate none-contractual elements such as trust and increase the RFID investment specificity to meet partners' business needs.

Moreover, since the IT/business units partnership lets firms develop internal expertise by coordinating reciprocal and interdependent activities between the IT and business units and coping with related uncertainties (Mitchell and Zmud 1999; Van de Ven et al. 1976), this coordination experience can be used in highly uncertain setting of value network where orchestrating and integrating purposeful interactions among network members is crucial (Grant 1996; Gulati et al. 2005). This coordinating and integrating experience may help in leveraging RFID technology capability for generating relational value. Thus, we predict:

Hypothesis 6:

*IT/business units partnership is a moderating variable that influences the effect of RFID synchronicity, integration, and scope of utilization on relational value cocreation.*

### **The interaction, reinforcing, and mitigating effect of the IT/business units partnership**

An interaction between the effects of individual RFID characteristics and the IT/business units partnership on relational value cocreation can be justified conceptually. When relationship specificity increases because of the frequent exchanges of high volumes of tangible and intangible resources (Dyer and Singh 1998), RFID synchronicity and integration become crucial for cocreating relational value.

The combination of greater RFID integration capacity, greater synchronicity, and optimal scope of utilization coupled with stronger IT/business units partnership is the most likely configuration to increase the cocreation and subsequent appropriation of relational value. Variation in the magnitude of one dimension (e.g., RFID becoming more synchronized as it generates substantial amounts of timely and high-quality information) would have little influence on the effects of the other dimensions (e.g., whether RFID integration with firm's back-end or business partners' systems is stronger or not). We argue therefore that firms with stronger partnership between their IT and business units are more likely to put in place high-quality RFID technology and thus minimize its adverse effects. In situations where there is variation in the level of RFID integration, synchronicity, or scope of utilization, this variation will influence the relational value cocreation less negatively and the relational value appropriation more positively if the firm has a stronger IT/business units partnership. Thus, we predict:

Hypothesis 7a, 7b, 7c:

*IT/business units partnership is a moderating variable that reinforces the positive effect of RFID synchronicity, integration, and scope of utilization on relational value cocreation.*

Hypothesis 8:

*IT/business units partnership is a moderating variable that mitigates the adverse effect of RFID synchronicity, integration, and scope of utilization on relational value cocreation.*

Hypothesis 9a:

*In firms with stronger IT/business units partnership, individual RFID characteristic (e.g., synchronicity, integration, scope of utilization) impacts positively the relational value cocreation.*

Furthermore, the common knowledge, mutual understanding, and coordinating mechanisms developed over time as the IT and business units work together for developing IT-based business solutions (Henderson 1990; Reich and Benbasat 2000) might be leveraged by identifying business opportunities and insights from the relational value network. These business opportunities and insights can be then integrated in a firm's individual business units. Thus, we predict:

Hypothesis 9b:

*Firms with stronger IT/business units partnership appropriate more cocreated relational value from their RFID partner network for their internal business units.*

Hypothesis 9c:

*Firms with stronger IT/business units partnership have shorter lag time for appropriating cocreated relational value from their RFID partner network.*

## **Conclusion**

Although this is typically a conceptual paper with a research model and hypotheses that need to be further empirically validated, it makes three contributions to research. First, By focusing on the IT/business units partnership and the three RFID characteristics – synchronicity, integration capability, and scope of utilization – which are different in nature and have different consequences, this paper extends the prior literature on RFID-enabled business value creation. We dig deeper into this concept to understand its

effects on value cocreation. We argue that prior studies on the RFID-related business impact and the mixed empirical results found in the literature can be reinterpreted using this new theoretical approach based on the differential RFID capabilities put in place by firms and their effects on structuring the mechanisms that drive the relational value cocreation and appropriation.

Second, the paper sheds light on the different paths through which relational value can be appropriated. We identify variables that can have a moderating effect on business value cocreation. While no studies had explicitly modeled the relationship between RFID technology and the appropriation of cocreated value, we show theoretically how finer-grained RFID characteristics vary and can produce positive, marginal, or adverse effects. Those effects on value cocreation and appropriation may be amplified by the quality of the partnership between the focal firm's IT unit and business units, which can compensate for the adverse effects of RFID technical limitations.

Finally, this study has implications for the IT strategic management research. Since the IT/business units partnership is at the core of IT strategic management, this conceptual study examines the role of this partnership in the context of RFID adoption and highlights its moderating and mitigating effects on firm performance. By taking into consideration the role of IT context, we develop an integrative view in which the RFID technology characteristics, the IT and business units partnership, and the nature of the business partners' network are all considered as having predictive power that can help to better understand the business impact of this technology.

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