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THE INSTITUTIONAL FACETS OF INNOVATION DIFFUSION INITIATING: THE CASE OF WAL-MART'S RFID CAMPAIGN

Les facettes institutionnelles de l'initialisation de la diffusion d'une innovation : le cas de la campagne RFID de Wal-Mart

Completed Research Paper

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Abstract

From two institutional perspectives, we discuss how an organization can initiate the diffusion of a radical IS innovation in its community by proactively exerting institutional influences. Through an in-depth historical analysis, we discuss how Wal-Mart initiated the RFID application in the retailing institutional field. From the institutional field angle, we discuss the structure, the scope, and the institutional carriers of the "RFID in retail" field in which Wal-Mart initiated the diffusion of RFID. From the institutional strategy angle, we profile Wal-Mart's strategic concerns on RFID diffusion, its interests, and its resources. In the institutionalization processes of the RFID in retail field, we identified that an organizing vision was created, held, and evolved within the field, and played a critical role in Wal-Mart's institutional strategy. By examining institutional perspectives of innovation fostering processes, this paper extends the literature on diffusion of radical IOS innovations in institutional fields.

Keywords: Innovation diffusion, RFID, interorganizational information system, institutional entrepreneurship, institutional strategy, organizing vision

Résumé

A partir de deux perspectives institutionnelles, nous discutons comment une organisation peut initialiser la diffusion d'une innovation radicale en SI au sein de sa communauté en exerçant de manière proactive des influences institutionnelles. Au travers d'une analyse historique en profondeur, nous discutons comment Wal-Mart a initié l'application RFID dans le champ institutionnel de la distribution.

Introduction

Although much has been written on diffusion and adoption of interorganizational information systems (IOS) innovations, relatively little attention has been given to how organizations initiate diffusion of IOS from an institution perspective. Three observations indicate potentials for research on how to initiate IOS diffusion. First, the dominant research diagram in information system (IS) innovation research, which links "quantity of innovator profile with quantity of IOS innovation" (Fichman 2004), has depended heavily on the economic-rationalistic thinking while ignoring the social-cognitive thinking. Given the collective nature of IOS, social facets of decision-making have been empirically proven to play key role in adoption of IOS (Iacovou et al. 1995; Premkumar et al. 1995; Teo et al. 2003; Webster 1995). This gap has raised the call for introducing an institutional point of view into IOS diffusion research (Fichman 2004; King et al. 1994). Second, the majority of IOS research tried to capture the driving factors that explained post hoc the diffusion of IOS, but they seldom addressed the strategic behaviors of proactive organizations in early phases of diffusion. A few studies investigated the social facets of IOS adoption; however, their institutional analysis focused on the isomorphism pressure during the later phases of IOS diffusion (Teo et al. 2003) or on the social consequences of IOS diffusion (Webster 1995; Wilson et al. 1998). These works neither covered the early phase of diffusion process, nor put sufficient emphasis on the substantial influence erected by ambitious initiators in IOS diffusion. There have been calls to fill this gap by taking into consideration the fact that organizations can actively intervene in the early phases of IOS diffusion through institutional means (Swanson et al. 1997; Van de Ven 1986). Finally, a few recent studies on institutional change have demonstrated the exciting connections between institutional entrepreneurship and innovation diffusion. However, to the best of our knowledge, this new research direction has not been used at all in the IOS diffusion research. IOS initiators did take sophisticated actions in Electronic Data Interchange (EDI) diffusion (Hart et al. 1997; Iacovou et al. 1995), but their proactive gestures have not yet been systematically examined. Further, there is a potential for incorporating the essential role of institutional entrepreneurship in IOS studies as it has been found to be an important facet in the diffusion of modern photography (Munir et al. 2005) and programming languages (Garud et al. 2002).

The above gaps in IOS research can be filled by examining the diffusion of a radical new technology, the Radio Frequency Identification (RFID) technology which is touted as a high-payoff IOS for retailing industry (Curtin et al. 2007). The diffusion of RFID has both social and cognitive attributes. The complementarity between RFID tag and RFID interrogator requires cooperation among supply chain partners (Sharma et al. 2008). The remarkable RFID mandate by Wal-Mart also stamped the diffusion of RFID with political power (Soon et al. 2008). In addition, the ambiguous and varying view of RFID deployment in retailing is the thread that stitches together retailers, suppliers, technology vendors, and other stakeholders (Quaadgras 2005; Riggins et al. 2006). Therefore, the debut of RFID in retailing provides an ideal scenario to examine the institutional facets of diffusion initiation of a radical IOS technology. In the following paragraphs, we discuss the theoretical bases for this study and then conduct a historical analysis of Wal-Mart's RFID campaign to profile the institutional facets of the early phases of RFID diffusion.

Theoretical Background

Three separate but related bodies of literature have influenced the development of the present paper. The first one is the existing IS research that employed the isomorphism perspective of institution theory. This literature highlighted the necessity and importance of using an institutional lens on IOS diffusion. The second is the literature on institutional entrepreneurship that suggests organizations exert institutional influence to foster innovation diffusion. The third is the literature on the pivot functionality of organizing vision in institutionalization process. This paper attempts to meld the latter two bodies of theory into new insights for IOS diffusion.

Isomorphism Perspective

IS theorists have long been using institutional theory to study adoption of IOS. Van de Ven (Van de Ven 1986) advocated that organizations should take actions to shape institutional leadership in managing innovation. Orlikowski and Robey (Orlikowski et al. 1991) contended that "IT development, deployment and use", to which IOS adoption research belongs, and other two genres of IT research can benefit considerably from emphasizing the institutional context of IT. King et al. (King et al. 1994) synthesized the impact of two types of institutional force, regulation and influence, on IT innovation.

The power of institutional theory in the IOS adoption was demonstrated by applying the isomorphism perspective in the research of IOS adoption. Explicit use of institutional theory in IOS adoption was pioneered by Teo et al. (Teo et al. 2003). Derived from DiMaggio and Powell's work (DiMaggio et al. 1983), Teo et al. argued that IOS adoption can be driven by three isomorphism mechanisms: coercive, mimetic, and normative pressures. Their regression confirmed that isomorphism pressure has significant explanatory power in predicting EDI adoption. Two studies on RFID adoption also incorporated this institutional analysis. Lai et al. developed a theoretical framework to evaluate the possible impact of institutional isomorphism in RFID adoption (Lai et al. 2006). Sharma et al. extended Teo at al's empirical work by combining strategic rationales and isomorphism pressures together to investigate driving factors for RFID adoption (Sharma et al. 2008).

Even though these studies (Lai et al. 2006; Sharma et al. 2008; Teo et al. 2003) successfully explained the isomorphic diffusion of IOS, they did not inquire about the origins of institution: where does the institutional pressure come from in the first place? These studies also did not focus on the role of proactive actors who create and promulgate institutional pressure. To extend the isomorphism perspective in IOS diffusion, we review below recent progress in the institutional theory area, that pertaining to the institutional entrepreneurship perspective.

Institutional Entrepreneurship Perspective

Also inspired by DiMaggio's work (DiMaggio 1988), research on institutional entrepreneurship tries to understand how organizations respond proactively to their institutional environment in favor of their strategic interests (Battilana et al. 2008; DiMaggio 1988; Oliver 1991). The term "institutional entrepreneurship" was defined as "the "activities of actors who have an interest in particular institutional arrangements and who leverage resources to create new institutions or to transform existing ones" (Maguire et al. 2004). The pattern of actions that institutional entrepreneurs take to realize their institutional interest is called "institutional strategy" (Lawrence 1999). Institutional entrepreneurship perspective tries to "reintroduce agency, interests and power into institutional analysis of organizations" (Garud et al. 2007), whereas isomorphism perspective emphasizes more on individuals' conformity and constrained behavior (Scott 2001).

Institutional entrepreneurship perspective provides innovation scholars with anchor points to explain the diffusion of innovation as being endogenously shaped by institutional entrepreneurs rather than exogenously driven by institutional pressures of isomorphism. Taking institutional entrepreneurship perspective, a number of studies have examined how organizations promote the diffusion of a variety of innovations, such as financial practice (Lounsbury et al. 2007), photography (Munir et al. 2005), electric light (Hargadon et al. 2001), etc. IS community has begun to explore this new perspective. Garud et al. (Garud et al. 2002) addressed the role of social and political skills that Sun Microsystems utilized in its sponsorship of Java platform. Wang and Swanson (Wang et al. 2007) explored how institutional entrepreneurs fostered new IT services toward widespread adoption.

Given the collective adoption nature, research on IOS diffusion (e.g., diffusion of RFID) can certainly benefit from institutional entrepreneurship perspective to examine how organizations can leverage the whole community to take action on adoption of IOS, thereby taking advantage of institutional change associated with diffusion.

Organizing Vision

Swanson and Ramiller's essay (Swanson et al. 1997) on organizing vision provided a handy lens to introduce institutional analysis in research on IOS diffusion. They defined the concept of organizing vision as "a focal communality idea for the application of information technology in organizations" (Swanson et al. 1997). They found that organizing vision, created and employed by actors in the interorganizational community surrounding the innovation, is central to the early diffusion of the innovation. They not only identified three key functions of organizing vision including interpretation, legitimation, and mobilization, they also illustrated how organizing vision can shape the diffusion process by performing these three key functions. Derived from this work, Wang and Swanson (Wang et al. 2007) investigated how to increase the likelihood of successfully launching IT innovation by shaping organizing vision.

From the institutional entrepreneurship perspective, Swanson and Ramiller's work has made two theoretical contributions for research on IOS diffusion. First, the creation of the organizing vision, a typical institutional process, is at work in innovation diffusion right from the very beginning, while isomorphism perspective works only when innovation adoption has been taken for granted. Consequently it expands the horizon of institutional analysis into the initiation phase of IOS diffusion. Second, organizing vision can be utilized by ambitious players in an interorganizational community to hammer out a preferred institutional environment where they can benefit from the institutionalization of the IOS. In other words, organizing vision can serve as an apparatus to execute institutional strategy. These two merits of organizing vision, e.g. targeting at institution creation and directing institution evolvement, are the fundamental ideas we use in our present paper.

In addition, the present paper is a response to Swanson and Ramiller's call for "retrospective and contemporary analysis of organizing vision" (Swanson et al. 1997). Since the process of RFID diffusion has been captured well as Internet discourse, it provides a great opportunity to employ a process-based methodology to observe how Wal-Mart used organizing vision to implement its RFID institutional strategy in retailing community.

Research Design

Research site

We chose Wal-Mart's RFID campaign as the research site based on the following three facts observed after the debut of RFID in retailing. First, collective beliefs in RFID diffusion are held by a set of organizations that conceptualize their options and movements in RFID adoption decision. Due to the great uncertainties in RFID adoption including retailer mandate, technology issues, and cost-benefit absorbing, the criteria used to justify RFID investment in retailing is based on a mental image of diffusion trajectory instead of instant cost/benefit calculations (Riggins et al. 2006). Second, the process of RFID diffusion in retailing is characterized by powerful initiators and political games. Not only did the political games exemplify the institutional leadership of dominant players in the field, they also laid out the dynamic social process of RFID diffusion. The mandate by Wal-Mart and other retailer giants are the most remarkable events that shaped the institutional environment of RFID in retailing (Soon et al. 2008). Third, RFID diffusion is not about technology upgrading, it actually "outpaces change in the institutional environment" (DiMaggio 1988) of retailing. RFID would create "a string of changes that could transform existing supply chain models" (Soon et al. 2008) and business models of retailing (Vowels 2006) as it will become an essential IT infrastructure in retailing, if adopted. The profoundness of RFID in retailing can be appreciated by referring to the structural changes in the retailing industry introduced by bar code. These three facts make Wal-Mart's RFID campaign particularly valuable to enhance our understanding in institutional entrepreneurship which shapes and in turn is shaped by institutional environment.

Research Method

Due to the exploratory nature of our paper, a narrative method is employed in this paper to perform historical analysis (Kieser 1994; Mason et al. 1997; Pentland 1999; Snooks 1993) on documentary data to investigate the active roles played by organizations during the institutionalization process of innovation. The historical case analysis approach has been applied successfully to investigate the organizational processes where institution and innovation interplay (Chandler 1956; Garud et al. 1994; Kimberly 1979; Munir et al. 2005). Additionally it is the preferred method in institutional entrepreneurship research (Battilana et al. 2008; Garud et al. 2002; Wang et al. 2007). The selection of historical analysis is also a response to calls in IS research, especially those of "process-oriented, historical study" (Swanson et al. 1997), "empirical evidence [...associated with] specific intervention with specific IT invocations" (King et al. 1994) and "inductive study" (Wolfe 1994). By iterating the discourse on RFID

diffusion, we will interpret both the institutional space of RFID in retailing and the institutional intervention of Wal-Mart. The institutional analysis in the present paper is performed at the organizational field level, specifically at the "RFID in retailing" field where the RFID diffusion process and the agency of Wal-Mart unfolded. This analysis unit enables us not only to examine the institutional facets of innovation that are ignored at other levels but also to investigate the social-political processes where RFID component players become involved in or attached to new ideas.

Data Collection

To provide a comprehensive description of how the RFID in retail institution was created and evolved, we chose to use the Internet as the second-hand documentary source due to the following reasons. First, Internet-based data sources have been suggested and used to capture the status of RFID diffusion in research (Fish 2006; Quaadgras 2005). Internet as an online media has timeliness virtue and has paid extensive and intensive attention to Wal-Mart's RFID mandate, and therefore provides sound and reliable coverage on Wal-Mart's RFID campaign. Additionally, text on the Internet is an essential part of RFID discourse, which the RFID players actually use and are fully immersed in. Internet text can serve as a "substantial trace in the public and private record" (Swanson et al. 1997), and as an atmosphere to "forge the iron cage"(Abrahamson and Fombrun 1992) of RFID in retailing.

To capture the institutional facets of RFID diffusion, we conducted a systematic effort to access publicly available information of the RFID diffusion on the Internet since 2004. We have been collecting and monitoring several sources to gain a wider appreciation of the events in the industry. We collected all the reports on RFID in retailing published in many on-line news services, including RFID Journal, New York Times Online, Wall Street Journal Online, InformationWeek Online, Computerworld Online, etc. We also subscribed to several RFID specific blogs, e.g., RFID Update, RFID Weblog, RFID Gazette, etc. In addition, we acquired white papers and analysis reports from consulting companies including IBM Business Consulting, A.T. Kearney, AMR Research, and others. We also obtained information from the RFID tracks in leading IS conferences (e.g., ICIS, HICSS and INFORMS). Finally, we kept records of public statements on RFID released from Wal-Mart[1] and other major players in the RFID community, such as Best Buy, Target and Intermec. These sources formed a cross-reference network to ensure that our data are not only authorized and real-time updated, but also detailed and comprehensive. All the data were collected in a qualitative research database for further review, retrieval and interpretation.

Using data from the above sources, we developed a chronology of events in RFID diffusion in retailing as they evolved. Critical events are briefly listed[2] in the left two columns of Table 1. The time-horizon of this list ranges from December, 1999 when the future of RFID in retailing was framed for the first time to the latest events until February, 2008 when Wal-Mart launched a new policy to push RFID further. Thus, this list is a contemporaneous snapshot of the process of RFID diffusion in retailing.

Two institutional facets – institutional field and institutional strategy – of Wal-Mart's RFID campaign are examined in a narrative style (Scott 2001) to review the introduction and institutionalization of RFID in retailing. The observations and interpretations in the following are from the efforts of standing back from the specific data we collected and then using these data later to piece together an institutional mosaic.

Wal-Mart's RFID Campaign: Initiating a Mandated Diffusion

Institutional Field

Wal-Mart's RFID campaign is carried out in an interorganizational community. This community comprises of "a heterogeneous network of parties" (Swanson et al. 1997) including retailers who read and use Electronic Product Code (EPC) in RFID tags, suppliers who prepare and deliver RFID tags, vendors who produce RFID hardware and provide RFID solution, standard setting bodies who manage the RFID standard and EPC license, and other numerous stakeholders who may accelerate or inhibit the diffusion of RFID in retailing. With its marketing power

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[1] Wal-Mart's publishes its public statement in Wal-Mart Facts (http://www.walmartfacts.com), the official website for Wal-Mart Store Inc.

[2] Due to page length limitations, we are not able to include the entire list of critical events in the table 1. Shaded rows in the table pertain to Wal-Mart's events.

over suppliers and vendors based on the demand and supply of RFID artifacts, and with its political power over standard setting bodies and media discourse, Wal-Mart tried to position itself as an intermediary or cheerleader among the network participators. However, the diffusion of RFID in retailing owes to aggregated efforts of all the participants. Essentially, campaigning for an innovation in such a community is not the "enterprise of a single entrepreneur," but a "network building effort" (Van de Ven 1986).

Date	Event	Phase	Vision
Table 1. Illustrative Critical Events of the RFID Diffusion in Retailing			
10/99	The Auto-ID Center was set up (Quinn 2003).	Emergence	Interpretation Mobilization
6/03	Wal-Mart mandated top suppliers to use RFID on pallets and cases(Editor 2003c).		
10/03	EPCglobal was formed to manage EPC network and RFID standards (Editor 2000).		
11/03	EPCglobal released UHF Class 1 RFID Standard Draft(Editor 2003b).		
11/03	Wal-Mart detailed RFID mandate requirement to its top 120 suppliers(Becker 2004; Wysong 2005).	Structuralization	Interpretation Mobilization
2/04	Target announced RFID mandate plan(Editor 2004c).		
3/04	Albertsons announced RFID mandate plan(Editor 2004a).		
4/04	Wal-Mart launched the first cases and pallets level RFID(Whitcomb 2004a).		
5/04	Wal-Mart lowered tagging rate expectation for suppliers to meet deadline (Sliwa 2004).		
6/04	Wal-Mart outlined 3-step RFID expansion plan (Whitcomb 2004b)		
8/04	Best announced RFID mandate plan(Roberti 2004).		
12/04	EPCglobal announced the ratification of UHF Gen 2 RFID standard(Update 2004).		
1/05	Wal-Mart presented RFID mandate achievement (Roberti 2005b).		
4/05	The first EPC Gen 2 UHF product, Impinj RFID tag, was announced.(O'Connor et al. 2005)	Evolution	Legitimation Interpretation
10/05	Target and Wal-Mart launched pilot to share EPC data with suppliers (Roberti 2005c).		
4/06	Wal-Mart announced it would no longer accept Gen 1 tag after 1/30/2006 (O'Connor 2006c).		
7/06	ISO approved the EPC Gen 2 Class 1 UHF standard as amendment to ISO18000-6C (O'Connor 2006a).		
4/07	EPCglobal's ratified the EPC Information Services specification (Bacheldor 2007).		
5/07	Metro asked 650 top suppliers to place EPCglobal Gen 2 RFID tags on all pallets. (Roberti 2007)		
9/07	Wal-Mart, Best Buy and entertainment industry conducted an item-level DVD-tagging pilot. (Swedberg 2007b)		
10/07	Wal-Mart unveiled 3 new RFID initiatives. (O'Connor 2007).		
1/08	Sam's Club asked suppliers to use EPC Gen 2 RFID tag on single-item. (Update 2008).		

Our institutional analysis on Wal-Mart's RFID campaign was conducted at the institutional field level, namely the "RFID in retailing" field. The RFID in retailing field, in this paper, represents the pattern of relationships among physical IT artifacts, practical operation routines, and socio-political interorganizational interactions related to the RFID diffusion in retailing. This concept covers not only the institutional content that the RFID system carries in retailing, but also the institutional environment in which RFID diffusion in retailing field is unfolding. This notion is similar to that of technological field (Garud et al. 2002) or innovation context (Van de Ven 1986). In a broader view,

the RFID in retailing field is an organizational field (DiMaggio et al. 1983) that refers to the organizational life of those whose interest will affect and in turn will be affected by the diffusion of RFID in retailing.

In the following, we replay the diffusion process in three phases to reveal how the RFID in retailing field emerged around the core technology, i.e., the RFID innovation, how actors in the field are structured under a retailer-supplier-vendor (RSV) triangle, and how the entangled interactions between actors droved the evolution of the field. In the story telling below, we will focus on the social-cognition system ruling the RFID retailing community. Of specific interest to us is the institutional environment that governs the initiation of RFID diffusion.

Phase I: Emergence of the Community

The community initially rallied around the Massachusetts Institute of Technology (MIT) Auto-ID center, a non-profit research institute established in 1999 to explore the future of RFID. It was the consumer package good (CPG) manufacturers and standard setting organizations who envisioned RFID as the next generation identification technology for supply chain management (SCM) and founded the Auto-ID center at MIT (Haberman 1999). The mission of the center was to answer three questions: how to make RFID microchips work, how to build software and network infrastructure to support the microchips, and how to harness RFID system (Quinn 2003). Organizations from different sectors of economics were attracted by the potential of RFID. CPG manufacturers like P&G and Gillette were concerned about out-of-stock and cargo-theft issues. Retailers including Wal-Mart, Tesco, Carrefour, Royal Ahold, and Metro were looking for efficient ways to lower operation costs. Technology vendors like IBM, SAP, Sun Microsystems, and Intel were interested in selling more software and hardware. And standard setting bodies, e.g. European Article Number International (EAN) and Uniform Code Council (UCC), expected that unified RFID standards can be widely accepted. The image of a unified, economic, and engineering-feasible RFID solution was the promising view that inspired so many organizations to gather together in Auto-ID center to form a collaborative platform for learning and seeking material interest from RFID technology (Quaadgras 2005).

Besides the explicit network of Auto-ID center, individuals also started their own journals to explore RFID. Scholars and universities put effort to improve RFID engineering and developed business archetypes (Lee et al. 2004). Wal-Mart and Metro launched open or secret RFID pilot projects (2003a; Roberti 2003). Innovative engineers set up RFID ventures (Impinj 2000). Meanwhile, various media, both general and specific, began to spread the basic idea of RFID to those who were wondering about the impacts of RFID on their businesses (Anderson 2002; 2004; Bacheldor 2004; Collins 2003; Johnson 2005; Jones et al. 2005; Kevin 2005).

Phase II: Structuralization of the Community

Following the knowledge building activities of the Auto-ID center, Wal-Mart's mandate unveiled a substantial push to the diffusion RFID in retailing which is characterized by a RSV triangle structure. At a retailing conference in June 2003, Wal-Mart spelled out its mandate by asking its top suppliers to adopt RFID technology. In the follow-up meeting summoned by Wal-Mart in November, Wal-Mart outlined the details of the "2005-Sunrise mandate": its top 100 suppliers must attach EPCglobal Ultra-High frequency(UHF) Class0/1 Gen 1 RFID tag on all pallets and cases being shipped to the 3 distribution centers (DC) of Wal-Mart in Texas before January 1, 2005. Just a few days before Wal-Mart imposed its deadline, EPCglobal released the draft of Gen 1 standard. This indicates a collision between retailing giants and standard bodies. EPCglobal Inc. is a joint venture that was set up by UCC and EAN on October 26, 2003 to build EPC related standards and to manage the commercializing of EPC. EPCglobal is directed by a board comprising of UCC, EAN and 16 other important logistics giants, including Wal-Mart. The membership of EPCglobal covers most of Wal-Mart's top 100 suppliers.

RFID vendors responded very quickly. For example, they set up test centers near Wal-Mart's DCs (Editor 2005c), opened product exhibitions in industry fair, and allied with consultants to provide integrated solutions (Editor 2004b). New ventures received investments from venture capital firms and existing barcode providers added new business sections. Based on the potential volume of retailer mandated adoption, RFID vendors, especially tag manufacturers, provided discount to Wal-Mart's suppliers. Slap-and-ship[3] solution was invented to meet suppliers who just wanted to comply with Wal-Mart's mandate (Swedberg 2007a).

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[3] Slap-and-ship is a method for manufactures to implement RFID which involves affixing tags on goods just before shipped to retailers. Because this method required little data integration, it is preferred by suppliers who only want to meet mandate at the least cost and do not care about other advantages from RFID application.

Eight ambitious CPG manufacturers soon participated in an RFID trial in Wal-Mart's DC in April 2004 to assess the real-world read rate of RFID tags (Whitcomb et al. 2004). Immaturity of RFID standards and high costs of RFID products were the hardest problems faced by all the top 100 suppliers. Wal-Mart urged its suppliers to organize a forum to share the lessons learned from the field operation. However, for small CPG manufacturers, tight budgets and lack of expertise made the compliance impossible before the deadline. So Wal-Mart had to reduce the proportion of tagged pallet to 65% in order that small suppliers can meet the sunrise day of 2005 (Wailgum 2004).

Soon after Wal-Mart imposed its mandate, other major retailers jumped on the bandwagon. Target (Editor 2004c), Best Buy (Roberti 2004), Albertsons (Editor 2004a), Tesco (Ltd 2005) and Metro (Editor 2005a) announced similar plans requiring their suppliers to cooperate with their RFID pilots. EPCglobal UHF Gen 1 became the de facto standard since it was embraced by all major retailers. At the end of 2004, EPCglobal released the draft of the second generation standard: UHF Gen 2 RFID.

The progress of RFID drew great attention from both the industry and the press. The entire RFID community kept wondering about the viability of mandate diffusion and guessing where the mandate is headed (Editor 2005b; Feder 2004; Hill 2004 ; Incucomm 2005). Wal-Mart's mandate finally got an acceptable result in March 2005 when Wal-Mart made a statement that 127 suppliers sent almost 5 million tags to Wal-Mart (Whitcomb et al. 2005). Wal-Mart itself deployed 14,000 sets of RFID equipment in its 104 stores and 35 Sam's Club locations (Editor 2005b).

Phase III: Evolution of the Community

After the 2005-Sunrise mandate, interactions within the RSV triangle entered a strategic stalemate in the middle of 2005. Wal-Mart continued to roll out RFID, and tried to evaluate RFID benefits by piloting in several real scenarios, including its DC, backroom, and store floor. A 29-week pilot project was conducted by the RFID research center in University of Arkansas to assess the impact of RFID on merchandise availability in Wal-Mart stores. The result of the pilots – a reduction of 16% in out-of-stocks, 3 times faster replenishment rate, and reduction in manual orders – encouraged the entire community (WalmartFact 2005). This finding also shifted Wal-Mart's RFID focus from DC application to in-store application (Songini 2007b), and inspired its expanded RFID deployment plan (WalmartFact 2006b). In Spring of 2007, Wal-Mart had 1000 stores RFID enabled and 600 suppliers complied. At the same time, Wal-Mart asked its suppliers to upgrade to EPC Gen 2 tags, a new RFID standard from EPCglobal that promises better performance and lower cost. Other retailers took baby steps even after they had confirmed the benefits of RFID through pilot tests. Best Buy, the most promising retailer for RFID adoption because of the high value of its electronic appliance goods, planned more pilots (Hudson 2007). Target launched a joint pilot with Wal-Mart to share EPC data with suppliers (Roberti 2005c), while it retreated from an aggressive implementation plan (Duvall 2007b). In general, these retailers were following a "shadowing strategy" (Fish 2006).

Except a few suppliers like Kimberly, Unilever and P&G who declared benefits from RFID (Editor 2006 ; Songini 2007a), most suppliers still suffered from unstable technology, high cost, and slim signs of benefit (Fabris 2007; Wailgum 2004). The transitional nature of Gen 1 RFID product and engineering problems during implementation frustrated most suppliers, especially those who had limited IT capabilities. The 2-year shortage and price drop of Gen 2 tags left suppliers with no options (Duvall 2007a). Worst of all, Wal-Mart gave no clue on how suppliers can really benefit from RFID (Duvall 2007b). Suppliers responded to the mandate reactively. They did little more than slap-and-ship. Complaints on the RFID mandate became a public secret in media (Gardner 2004; Hudson ; McWilliams 2007).
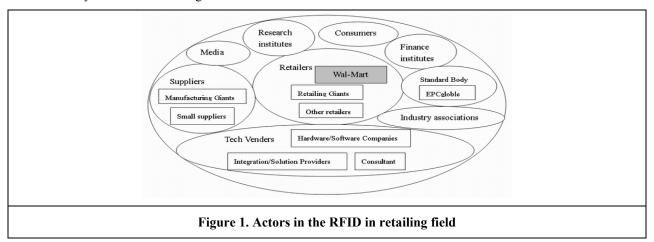
EPCglobal ratified more standards to accelerate the diffusion of RFID. EPC Gen 2 was officially merged into ISO18000-6C (O'Connor 2006a). This event affirmed that EPCglobal's standard will be delivered globally and make vendors more confident in compatibility of their products. EPCglobal also finalized the EPC Information Services standard (EPCIS) to improve the information sharing between suppliers, retailers and other companies along the value chain (Meranda 2007). However, EPCglobal's progress failed to lower tag price. This is because, from RFID vendor's perspective, price drop of RFID tag was encumbered with 3 factors: volume, patent war, and Gen 2 update. The installed base resulting from Wal-Mart's mandate was limited since most suppliers took passive attitude and purchased as little as they could (Fabris 2007). The scale economies were not enough for vendors to overcome the learning curve. The very short time gap to update from Gen 1 to Gen 2 worsened this situation by increasing the cost for vendors to retrieve their investment on Gen 1 production line. Finally, the patent issues had more consequences on the price of RFID equipment. On the one hand, the speed for launching new products was delayed heavily. For almost 2 years Impinj was the only Gen 2 tag provider in the market (Roberti 2005a). On the other hand, dozens of

RFID vendors formed patent consortium (O'Connor 2006b; Roberti 2005a) to resist Intermec's fundamental royalty declaration. These events certainly increased the uncertainty and cost of Gen 2 tags.

After three years of stalemate (Sullivan 2006), Wal-Mart's RFID group made new movement to break the deadlock of the RSV triangle. In the middle of 2007, Wal-Mart pushed further the agenda of RFID diffusion in retailing by unveiling three new initiatives: mandating on entire specific product categories, deploying whole-process RFID in Sam's Club, and applying RFID on weekly product promotions (O'Connor 2007). And the initiative in Sam's club has been rolled out in January 2008 (Update 2008).

Actors in the Field

We put actors of the RFID in retailing field in Figure 1 to illustrate the field as the integrating rubric bringing together chained but heterogeneous parties and the sub-groups they belong to. The figure is not an exhaustive but an illustrative description of the boundaries of the field. Three observations about the community are worth noting. First, these parties did not show up simultaneously at the beginning of the institutional process, but became involved in or were even created during the three institutional phases discussed above in the RFID in retailing field. For example, the EPCglobal was set up 4 years after Auto-ID center began to explore the possibility of RFID. Second, these actors and the interactions between them were not equal to each other, but they played different roles and were weighted differently in different phases of the institutional process. Wal-Mart's role during the diffusion exemplified this variation vividly. Last, and most importantly, the observations above can only be perceived by using a process-oriented analysis method at the organizational-field level.

Figure 1. Actors in the RFID in retailing field

Institutional Carriers of the Field:

There exist a variety of institutional carriers that shape the social-cognitive framework of actors in the RFID in retailing field. By analyzing the RFID discourse in retailing, we identified these carriers and grouped them under four categories in Table 2 following Scott's classification of institutional carriers (Scott 2001).

In the artifacts category, three main carriers act as the cornerstone of the institutional environment of RFID. The complementary nature of the RFID tag and RFID interrogator is the source of collective decision making as any open-loop RFID application in retailing must rely on cooperation between upstream and downstream organizations along the value chain. The broad acceptance of EPCglobal and ISO RFID standards guarantees that RFID institution is based on an open foundation. While the RFID patent is controlled by several vendor groups, like Intermac and the RFID Consortium, the political games of these interest groups will dominate the demand-price curve of RFID hardware for a while.

Routines existing in retailing, especially those performed between suppliers and retailers, embody and represent a consensus understanding that defines what are efficient, acceptable, and desirable behavior patterns. Some routines, like POS and barcode scanning, have been stabilized and routinized through the historical improvements in retailing in the past 30 years (Hwang et al. 2005). Some routines, such as those required by Wal-Mart, like EDI and DC delivery, have been coded in and consolidated by market power. And some new routines are still in the process of being shaped, for example, the advanced practices in Table 2. Most routines in retailing will be changed based on

the new operational meanings of RFID. These practices mainly stand for the normative and regulative meaning of the institution in the field.

Table 2. Institutional Carriers of RFID in retailing field	
Type	Carrier
Symbolic Systems	mandate diffusion, economy of scale and scope, value of SCM, experience of barcode
Relationship Systems	supply relationship, EPCglobal membership, collusion and compromise in the RSV triangle
Routines	SCM practices: fast replenishment, EDI, barcode scanning, point of sell(POS) checkout, DC delivery, cross-dock operation, Vendor Managed Inventory (VMI) advanced practices: reverse logistics, whole-process visibility, accurate inventory control
Artifacts	RFID tag/interrogator, EPCglobal standard serials, ISO standard family, RFID Patent

The relationship systems in RFID in retailing field mainly bear the regulative and cognitive institution. An actor's role and position in the power system of retailing network codify the rules and beliefs hovering over the field. Wal-Mart's RFID mandate manifests these rules and beliefs. The membership of EPCglobal is not only a source for accessing the authority of RFID standard, but also a status of an important player in the field. Both the slap-and-ship solution and the commemoration of 2005-Sunrise mandate reflected the collision and compromise among the entities in the RSV triangle relationship.

Finally, the expectation that mandated diffusion can lower the price of hardware of RFID is the shared cognitive diagram for actors in the field, and is part of the symbolic systems of the field. The highly identified value resulted from experiences in bar code scanning, EDI and other SCM technologies, has become common sense knowledge for the field. All these institutional carriers are undergoing transformation from barcode based systems to an RFID based systems, and the socio-political process and shared beliefs behind them are evolving with the community itself.
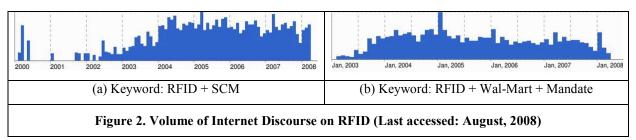
Vision as a Convergent Institutional Carrier

The organizing vision, "a sensible and credible image about the innovation created and employed" by the actors in the field, can serve as the igniter in the initial phase of the diffusion process by executing its three basic functions: interpretation, legitimation, and mobilization (Swanson et al. 1997). Following this seminal idea, we find that an organizing vision did emerge and play a crucial role in the diffusion of RFID in retailing. Such a vision brought together the retailers, suppliers, vendors, and other RFID stakeholders constituting the relationship space of the RFID in retailing community. More importantly, through proactive and strategic creation and modification of the RFID organizing vision, Wal-Mart tried to shape the new RFID in retailing institution in order that it could gain great competitive benefit from the RFID institution.

Following Swanson and Ramiller (Swanson et al. 1997), we define RFID vision as an idea in the retailing community for embedding and utilizing the RFID technology in business activities. RFID vision is an expectation accepted by all actors in the retailing RFID community that describes the future of RFID for the actors who have material interest in it. It is a conceptual framework for those actors to position themselves in the RFID community. Also, it is a social agreement negotiated and renegotiated during the process of creation of RFID in retailing field. In the initial phase of innovation diffusion when the costs and benefits of the innovation are still vague, organizing vision acts as a generative force that sets the initial conception and enactment of innovation, since there is no existing accurate evaluation but beliefs about what is or is not feasible (King et al. 1994).

Such an organizing vision emerged, developed, and evolved following the rhythms of the RFID community discussed in the aforementioned 3-phase process. In the emergence phase, the conceptual vision was built up by Auto-ID center and organizations rallied around the center collectively. Though the RFID diffusion vision in this period was immature and puzzling, an idol of the vision was set up. Buzzword about the wonderful future of RFID filled up in the business magazines during the period 1999~2003. Organizations directly or indirectly got involved in the experiment to prototype the physical system and to understand the typical business scenarios. The RFID vision in this phase was mainly interpretive and mobilizing. In the structuration phase, the vision was directed mainly by Wal-Mart's implication that volume demand resulting from the mandate of retailers can trigger hardware price

drops, especially that of the tag chip, and thereby advance the diffusion of RFID in retailing. Popular media put great effort in predicting the result of mandate: how many suppliers will comply, how much money they will invest in adoption, and so on. Though the engineering knowledge about how to deploy RFID system was still vague, all the actors thought that Wal-Mart's mandate was a promising way to foster RFID diffusion. This is because the great market power and huge pallet volume of Wal-Mart was essential for the scale economy in RFID equipment, and the economy of scale is an essential condition for large scale adoption. The RFID vision in the structuration phase mobilized vendors and suppliers by allowing interpretations of Wal-Mart's mandate to the field. In the evolution phase, RFID vision was reformed during the stagnation that was brought up by renegotiations among the actors in the field. The news about RFID in retailing was sparser in this phase than in the early phases. And the content of the news was more focused on complaints about the price and quality of tags, and the dimming picture of RFID ROI. Suppliers asked for adoption incentives and lower adoption costs which was promised by the early version of the vision. Vendors wanted to add solutions for patent issues and higher demand into the vision. Wal-Mart was also busy in modifying the vision to accommodate the interest of other actors. Legitimation and interpretation were the main concerns of the RFID vision during this phase. We mark the functionalities of the RFID vision in different phases in the right two columns of Table 1.

| (a) Keyword: RFID + SCM | (b) Keyword: RFID + Wal-Mart + Mandate |

Figure 2. Volume of Internet Discourse on RFID (Last accessed: August, 2008)

The materials we collected not only expressed the RFID vision in text, but also traced the process of RFID institutionalization (Munir et al. 2005). We got the timeline graph of the news archive from Google News[4] which counts headlines of news on certain topic in media archive. Figure 2 (a) illustrated the historical development of RFID discourse, ranging from the founding of Auto-ID center in 1999 to the latest Sam's club mandate in 2008. Figure 2(b) capture the density of attention on Wal-Mart's campaign in the RFID in retailing field. The steady increases in both histograms around 2003 reflect the increasing attention to the application of RFID. The spur peaks in Figure 2(b) between the years 2003 and 2005 show that Wal-Mart's mandate has dominated the institutional environment of RFID. The falling back of headline count after 2005 in Figure 2(b) roughly depicted the struggling status of Wal-Mart's RFID campaign. The spur in 2008 in Figure 2(b) revealed that the community is stimulated again by Sam's Club's new RFID mandate. From these histograms, we can evaluate the impact of Wal-Mart's mandate on the shared belief in the RFID in retailing field. Wal-Mart's RFID campaign became the cheer leading event in the field and the whole community danced on Wal-Mart's tune.

Institutional Strategy

The field analysis above has demonstrated that innovation is "inherently political and the desirability of particular innovation varies greatly when the question of who wins and who loses is raised" (King et al. 1994). Organizations in the field can respond to institutional processes passively or actively (Oliver 1991). Mindful organizations would put efforts "to identify political opportunities, frame issues and problems, and mobilize constituencies" (Rao et al. 2000) to tap the possible benefits of institutional change.

In the RFID case, Wal-Mart formulated a strategy to set up a new institutional arrangement in the retailing industry. We believe that Wal-Mart's RFID campaign, characterized by its RFID mandate, is an institutional project for the retailer to leverage the RFID in retailing field. To implement an institutional strategy, an organization will create or maintain common meanings and identities to which the community around the focal organization can adhere so that

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[4] Google News service (http://news.google.com/archivesearch) counts headlines across a large collection of historical archives, both traditional media and online media as well as free and paid subscriptions, including major newspapers/magazines, news archives and legal archives. The pool for searching covers BBC News, Time Magazine and Guardian, Washington Post Archives, Newspaper Archive, and New York Times Archives.

the focal organization can realize its material interests. We contend that the RFID vision is the core of Wal-Mart's institutional strategy. By manipulating the creation and the update of this vision, Wal-Mart stepped out into the institutional realm with its institutional strategy for RFID in retailing.

Wal-Mart's RFID Institutional Strategy

Central to the institutional strategy is the relationship between institution and interests. DiMaggio once commented: "New institutions arise when organized actors with sufficient resources (institutional entrepreneurs) see in them an opportunity to realize interests that they value highly" (DiMaggio 1988).

Promoting the RFID institutional change can obviously benefit Wal-Mart in a big way. First, RFID-based applications can improve operating efficiency greatly. Retailers, including Wal-Mart, can benefit from RFID at least in three primary ways: (a) reduce by 5% the total system inventory, (b) reduce by 7.5% the annually recurring labor cost in store and in the warehouse, and (c) reduce by 7% the out of stock situations (Kearney 2003). Wal-Mart as the largest retailer who is running the most sophisticated supply chain operations can fully tap these benefits. A consultant in AMR Research estimated that Wal-Mart can save 6~7% percent of cost associated with supply chain including storing, transporting, and keeping track of goods; using 2002 figures as the base, this annual cost savings would be about $1.3 billion to $1.5 billion (Shim 2003). Another estimate shows that Wal-Mart might achieve up to 8.35% pre-tax annual saving when RFID technology is deployed throughout its operations (Roberti 2003). Wal-Mart's pilots in 2005 confirmed some of these estimates. According to the report, RFID can reduce 16% of out-of-stock loss which almost doubles the estimate in Kearney's report (Hardgrave et al. 2006). As the biggest retailer, Wal-Mart's effort in fostering RFID institution in retailing is a calculated effort to improve its supply chain efficiency.

RFID based applications can also have a profound impact on the existing socio-political construction in retailing. The real-time visibility enabled by RFID will tie the partners in the retailing industry more tightly. Commodity unit, container, pallet, case, or even single item of product, can be tracked by reading RFID tags attached on them. Local turbulence in supply chain will be spread quickly in the community. Bargaining power will shift more towards dominant players like Wal-Mart who already possess huge market power and global influence. Labor-employer relationship will also be altered due to the deeper automation created by RFID technology. RFID is also an important component for building electronic commerce platform which is a promising direction for retailing industry. In addition, Wal-Mart can also gain from new trade models that allow for zero or negative cash-to-cash cycle enabled by RFID technology (Vowels 2006). Most important of all, under the new RFID institutional arrangement, retailers reap the advantage of economies of scale and scope from the RFID system while CPG manufacturers bear the cost of RFID tag. The profoundness of RFID institutional change can be inferred from the institutional change of another identification technology, the barcode (Haberman 1999). During the "revolution behind checkout counter," three profound social changes were brought about by the application of barcodes (Brown 1997). First, the barcode-based IS contributed to the pattern of increasing concentration in retailing due to the combination of high volume and low price product, as well as low operation cost that resulted from barcode-based applications. Second, barcode-based IS enabled product proliferation by lowering the inventory requirements and automating the record keeping tasks for huge categories of CPG. Third, the information collected from barcode-based POS systems shifted bargaining power from manufacturers who once possessed information concerning sales trend to retailers who could now detect demand instantly. As one of the key promoters of barcode diffusion in retailing, Wal-Mart is no stranger to the institutional benefits of RFID. Wal-Mart can consolidate or even boost its dominant position in the value-chain by exploring the significant changes that resulted from introducing and institutionalizing RFID applications in the retailing industry.

Wal-Mart has amassed huge resources to execute its RFID institutional strategy. It has both horizontal and vertical dominant market power. With its horizontal market power, Wal-Mart can lead the deployment of RFID in retailers. With its vertical market power, Wal-Mart can push its suppliers to cooperate with its RFID deployment. Holding substantial influence in the ecology of retailing, Wal-Mart can make more actors in the RFID institutional community get on the RFID bandwagon. Wal-Mart also has cutting-edge IS expertise to initiate, deploy, manage, and utilize the RFID technology. Wal-Mart has been the pioneer in several important IS in SCM technology including inventory control systems (1974), barcode systems (1980), satellite communication (1983), EDI (1985), VMI and efficient consumer response (ECR) (1989). It is believed that Wal-Mart owns the most powerful civilian computing systems in the world. Finally, Wal-Mart is actually good at promoting new strategic IS. The critical event in the history of barcode diffusion is the joint mandate by Wal-Mart and K-Mart which quadrupled the number of barcode-enabled suppliers. Wal-Mart also successfully fostered its EDI system, Retail Link, in 1990's. Therefore,

Wal-Mart can play its RFID institutional strategy quite effectively using its technical capabilities, slack resources, and dominant power.

With both huge interest and slack resources, Wal-Mart formulated its strategy to introduce and institutionalize RFID in retailing: "[Wal-Mart] view[s] RFID as a strategy that offers tremendous competitive advantage" (WalmartFact 2006a). Ms. Dillman, Wal-Mart's CIO, stated "This[RFID] is absolutely a global directive for Wal-Mart" when she spelled out the mandate in 2003 (Editor 2003c). Two classes of institutional strategy have been recognized: intended and emergent (Lawrence 1999) or proactive and passive strategies (Oliver 1991). Wal-Mart's institutional strategy is an intended and a proactive institutional strategy. Wal-Mart planned to put $3 billion in its RFID project (Wailgum 2004). Wal-Mart has been studying the potential of RFID for more than 12 years before its mandate in 2003 (Roberti 2003), and beginning in 2000, it started putting great efforts to advance its RFID institutional strategy. Wal-Mart actively cooperated with standard setting bodies by investing in Auto-ID center, joining the board of directors of EPCglobal, and drafting up RFID standards. In 2003, Wal-Mart subjected its top 100 suppliers to fix tags on pallet and cases, and expanded the mandate to other 600 suppliers. At the same time, Wal-Mart deployed RFID system in almost 12 DCs and 1000 stores. With the tagged cases and pallet, Wal-Mart conducted several pilots to evaluate RFID in real scenarios. In 2006, Wal-Mart upgraded its RFID facilities to EPC Gen 2. Recently in 2008, Wal-Mart spelled another round of RFID mandate to its suppliers for Sam's club. It is often said that an innovation without a champion gets nowhere. Wal-Mart is the champion in the institutionalization of RFID technology in the retailing industry.

Vision in Wal-Mart's RFID Institutional Strategy

Two problems challenge Wal-Mart's RFID institutional strategy. One is the great gap between a reasonable adoption cost and the market price of RFID solution. In 2003 when Wal-Mart mandate was issued, the price for an EPC Gen 1 tag is almost 60-80 cents. This cost of RFID tags at an item-level is quite high for CPG suppliers to absorb as their margin is typically under one dollar for a single item. Even at the pallet and case levels, the labor cost to fix RFID tag on each case is still too expensive, not to mention the cost of switching existing production process to a RFID-enabled process. It was estimated that for a mid-tier CPG manufacturer with annual sales of $5 billion, approximately 200 million tags are needed for tagging pallets and cases. Even with an expected cost of 5 cents per tag, the total cost is still 11 million every year (Kearney 2003). The other problem facing Wal-Mart's strategy is the extremely asymmetric allocation of costs and benefits between suppliers and retailers. As an open loop application, RFID tags must be attached on cargo in suppliers' warehouse. Except for a few giant manufacturers like P&G, Kimberly, etc., most CPG manufacturers do not have the need for accurate position data of their product. Therefore, they can not realize significant net benefits from RFID adoption. On the contrary, giant retailers like Wal-Mart can reap the benefit of RFID by significantly improving their operational efficiency since they are handling almost billions of pallets and cases every year. And the upside for retailers is that most of the RFID implementation cost, including investment in interrogators and systems integration, is fixed. Even in the initial phase of RFID diffusion when hardware systems and software solutions are very expensive due to limited adoption, retailers with slack resources can invest for later gains while suppliers bear the painful cost of RFID tags.

By publicly announcing a radical RFID mandate plan, Wal-Mart sketched a RFID vision to solve the two problems listed above together. The ideal scenario of the vision works in the following manner. First, by leveraging its market power, Wal-Mart will enforce its suppliers to purchase substantial number of RFID tags from vendors. This demand from suppliers will stimulate RFID vendors to invest more in production capacity. Increased production capacity and volume demand for RFID will lead to a price drop. Price drop, in turn, will accelerate more mandates and adoption. Once the installed base of RFID has reached a critical mass, the diffusion process will become a positive feedback cycle which can self-enforce its own growth. Therefore, the RFID institution can establish itself. The kernel of the vision is to leverage Wal-Mart's political power. This vision has a very elegant architecture in which the two different driving forces for innovation (King et al. 1994), demand pull and supply push, both meet at Wal-Mart. On the one hand, Wal-Mart can increase RFID demand by mandating its suppliers. On the other hand, Wal-Mart can increase RFID supply by colluding with RFID vendors. So Wal-Mart became the pivot of the RFID in retailing vision, and it could manipulate the vision in a very sophisticated manner in its own interests.

This RFID vision is also attractive, at least acceptable, to actors in the field other than RSV triangle members. DiMaggio labeled actors who can provide legitimacy support to and can gain from the success of the institutionalization project as "subsidiary actors" (DiMaggio 1988). While the RSV triangle structured the core constituencies for RFID institutionalization project, subsidiary actors can render legitimacy to the public accounts of the vision. Standard setting bodies are glad to see their standards being widely accepted and deployed, since Wal-

Mart requires an open and royalty free standard: EPCglobal RFID standard family. Vendors and consultant regard RFID as referencing business. Financial institutions like the story of learning curve because RFID industry is a big cake and has substantiality. Media, industry associations, and research institutions all enjoy the concept of high-efficiency SCM technology and the opportunity for cheerleading for RFID. Even for CPG suppliers, since the required standard is open, they at least do not need to worry about lock-in effects. Some progressive CPG manufacturers also hope to benefit from RFID. After the social agreement on expectations from RFID was established, this organizing vision began functioning as a strong institutional force to regulate behavior of actors in the field (Swanson et al. 1997). Thus, Wal-Mart's vision about how RFID can be diffused in retailing becomes critical in the long run to "create the social, economic, and political infrastructure a community needs in order to sustain its members" (Van de Ven 1986).

Dynamics of Wal-Mart's Vision

As discussed above, vision evolves with the community. The organizing vision for RFID actually appeared from the very beginning when RFID started its journey in the RFID in retailing community, although it was vague at that time. During the emergence phase, the community focused on the question of "What is RFID good for?" Auto-ID, as the neutral hub of community, directed the vision by exploring the business case (What is RFID good for?) and the technology solution (How does it work?). The main function of the vision in this period was interpretation. Wal-Mart played a learning role during this period and prepared its institution strategy. When the structuration phase started as Wal-Mart spelled out its mandate, it took over the baton and released its own version of the organizing vision for RFID diffusion which provides a sound answer for "How should RFID be implemented in retailing?" This vision was validated and updated as RFID diffusion occurred. When the RFID diffusion process entered the evolution phase, Wal-Mart and other actors struggled to fix the flaws in the vision. After renegotiating with other actors in the community, Wal-Mart modified the vision and released new version in the beginning of 2008 by spelling out new mandate to Sam's Club's suppliers and in specific category suppliers. During the evolution phase, Wal-Mart's vision of RFID focused more on "under what condition its benefits might be realized."

From the analysis above, we find that Wal-Mart's RFID campaign is supported by the Wal-Mart's vision for RFID. And the progress of Wal-Mart's campaign is falling and rising with the change of its organizing vision. By leveraging its market power, Wal-Mart fully explored three basic functions of its organizing vision. By emphasis on the benefit of RFID, the mandating pressure, and the diffusion driving force, Wal-Mart successfully interpreted, legitimized, and mobilized the actors in the community to invest in RFID projects and adopt the RFID system. In all, the close connection between Wal-Mart's RFID campaign and RFID vision is the key to understanding the diffusion of RFID in retailing community.

Discussion and Summary

Our institutional analysis in the initiating phase of RFID diffusion has several theoretical implications. First of all, we found a RSV structure in the community of innovation. The triangular institutional structure may appear when a powerful actor tries to push its tightly-coupled business partners to adopt an innovation and the supplier of the innovation has great expectations from the mandate. Prior research has usually focused on the bi-directional interaction between powerful actors who initiate the diffusion and their business partners who comply with the mandate (Hart et al. 1997; Iacovou et al. 1995; Webster 1995). Although these studies successfully revealed the dualistic power relationships, they ignored the triangular patterns in which suppliers of the innovation were included as the third group in addition to the initiator group and follower group. With the totality of the organizational field analysis unit, we captured this institutional pattern and depicted its development.

Additionally, our institutional analysis highlighted the role of vision as an instrument for institutional strategy. Our observation on the organizing vision's role in Wal-Mart' institutional entrepreneurship illustrated that vision can be used as the pivot for institutional strategy. In Wal-Mart's RFID campaign, the mandated adoption vision bridged demand side pulling and supply side pushing together, and provided the community a mutually acceptable framework to justify their attitudes toward RFID. Simultaneously, Wal-Mart maintained a compelling pressure on suppliers by selling the vision to the community. This pressure was further enhanced when other retailers like Target and Best Buy also issued a similar mandate. Certainly, it is a challenge even for Wal-Mart, who possesses great influence in the community, to manipulate this vision because it is an expectation held by the entire institutional community. As an institutional component, vision also constrains the actors of the community. Wal-Mart's vision almost went dead because some of Wal-Mart's suppliers were not able to meet the 2005 January deadline. Wal-Mart

did a lot of work to keep the vision alive by lowering proportion of tagging and postponing the deadline slightly. Therefore, it is a promising direction to study how firms create, update, and modify their institutional visions and keep them in good currency, and to further explore how organizations implement their institutional strategy, i.e., how do they behave as institutional entrepreneurs.

Finally, our work responded to the call for new research avenues in IOS innovations. By employing institutional analysis, we reconceptualized RFID innovation as an RFID in retailing institution. By capturing the RSV triangle pattern and the RFID vision, we introduced complicated social interactions to fill the holes in traditional diffusion models. By employing historical analysis, we detailed the evolution of several social constituents to uncover the dynamic processes that are usually lost in variance research. And by selecting RFID diffusion, we opened a window to investigate mandated diffusion of radical IOS technologies.

Our findings also yield interesting implications for organizations. An institutional strategy can be an alternate tool for organizations to gain competitive advantage, especially in situations when radical innovation is going to be introduced. Organizations can use organizing vision as the key institutional carrier to formulate and implement their strategy or they can use it as a discourse tool to persuade or coerce the entire institutional community for taking action on vision (innovation) adoption. When implementing institutional strategy, organizations should update and modify the vision carefully and frequently to maintain its legitimacy.

Our study is preliminary and has a number of limitations. First, the current paper only scratched the issues of institutional entrepreneurship and future research should explore this aspect in depth. Although several sets of tactics used to implement institutional strategy have been enumerated, e.g. Fligstein's 15 social skills, Oliver's 5 strategic responses, Munir et al.'s 4 discursive strategies, and Maguire et al.'s 3 sets of critical activities (Fligstein 1997; Maguire et al. 2004; Munir et al. 2005; Oliver 1991), there is a lack of an integrating framework to accommodate these fruitful findings. A unified institutional strategy model can be mapped onto Wal-Mart's RFID campaign to elaborate these tactics. Second, given that RFID diffusion is still relatively immature, the consequences of Wal-Mart's campaign are not fully unfolded yet. The stability and generality of results in the present paper should not be extended beyond the initiating phase of diffusion. Important findings from isomorphism perspective of institutional theory (Sharma et al. 2008) is not merged in the present paper. Third, our narrative and interpretation of Wal-Mart's RFID campaign is based on our perceptions from Internet-sourced discourse, and the possibility of subjectivity clearly exists. Finally, we have examined institutional facets of RFID diffusion in retailing from a Wal-Mart centered perspective. However, we believe that there actually exist many promising directions that are fit for institutional analysis and worth pursuing in the RFID diffusion process. For example, the institutional collusion between the general RFID institution and the retailing RFID institution is a distinct possibility. Also, a dual case study can be designed to compare different institutional settings of two similar innovations: RFID and barcode. Beyond RFID diffusion, there are other profound institutional changes taking place that deserve examination from the institutional entrepreneurship perspective of institutional theory. For example, during the open source movement where dominant firms such as Microsoft are fighting with emerging challengers and marginalized firms, such as SUN Microsystems, both sides are playing institutional strategy – one side to resist innovation and one side to embrace innovation.

Acknowledgements

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